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Interpretive Programming at the Caguas Botanical and Cultural Garden in Puerto Rico

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Abstract

This report developed educational materials that can be used to increase the environmental literacy of visitors to the Caguas Botanical and Cultural Garden. The team utilized general and archival research, field expeditions and expert interviews to complete the project. The team developed a new trail, Back to Our Forest Roots Trail System. To complement this trail the team cataloged and researched 128 plants found along the trail. The team also developed interpretive stories based on 25 indigenous plants known by the Taínos that are located on the trial. The team then designed a guided brochure that included interpretive stories, descriptions of the extant petroglyphs, explanations of the grove areas, a map of the new trail (FoRTS), a glossary of Taínos terms, and uses of the plants.

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Executive Summary

As Puerto Rico is fortunate to have a year-round tropical climate, it is an ideal place for a botanical garden where plants can flower and fruit throughout the year. The Caguas Botanical and Cultural Garden (CBCG) in Puerto Rico is a botanical garden that is comprised of over 60 acres of land designed to display over 250 species of plants [Jardín Botaníco Cultural de Caguas [JBCC], 2007c]. Today, the CBCG is designed to educate visitors about "Puerto Rican culture in relation to nature" as well as "tropical agriculture." Founded by the government of Caguas in 2007, the garden has been serving Puerto Rico as a place for visitors to learn about Caribbean history in a natural environment and to realize the importance of defending the natural world [Glogiewicz, Personal communication, January 21, 2010].

The CBCG is composed of nine separate groves, officially referred to as: the Taíno ancestral grove, the African ancestral grove, the timber grove, the fruit grove, the palm grove, the artisan grove, the ornamental grove, the flower grove, and the wetlands. Currently, three different tours are offered including the Tour of the Historical areas, the Tour of the Archaeological sites, and the Agro Tour [JBCC, 2007c]. The CBCG offers a wide variety of tours in an attempt to reach as many people as possible, and to create lasting impressions that will positively impact the visitors and their relationship with the environment [JBCC, 2007c].

The goal of this project is to educate the visitors of the CBCG on the Taíno lifestyle and their relationship with the ecosystem, while enhancing the visitor's curiosity to learn about living more harmoniously with nature. The team began research on interpretive programming as a result of the sponsor's recommendation. Further research was conducted on the history of Puerto Rico and the histories of the cultures that comprise the island, focusing mainly on the Taínos. While at the garden, the team conducted field expeditions recording pertinent information, and

performed interviews. The team and the sponsor decided that the interpretive program resulting from this project should include a new trail system, a plant list, a set of interpretive stories, and a guided brochure.

Utilizing the existing tree groves, a new trail system was set up for the use of the CBCG. Named by the team as the Back to Our Forest Root Trail System (FoRTS), it was designed to increase the visitors' environmental literacy. The FoRTS leads the visitors through the fruit grove, the timber grove, the ornamental grove, the wetlands, and the Taíno ancestral grove. For the purpose of our project these were renamed as the fruit orchard, managed forest grove, wetlands, pre-garden, garden, and Taíno grove. This trail, in its original conception, can be seen on the map below:

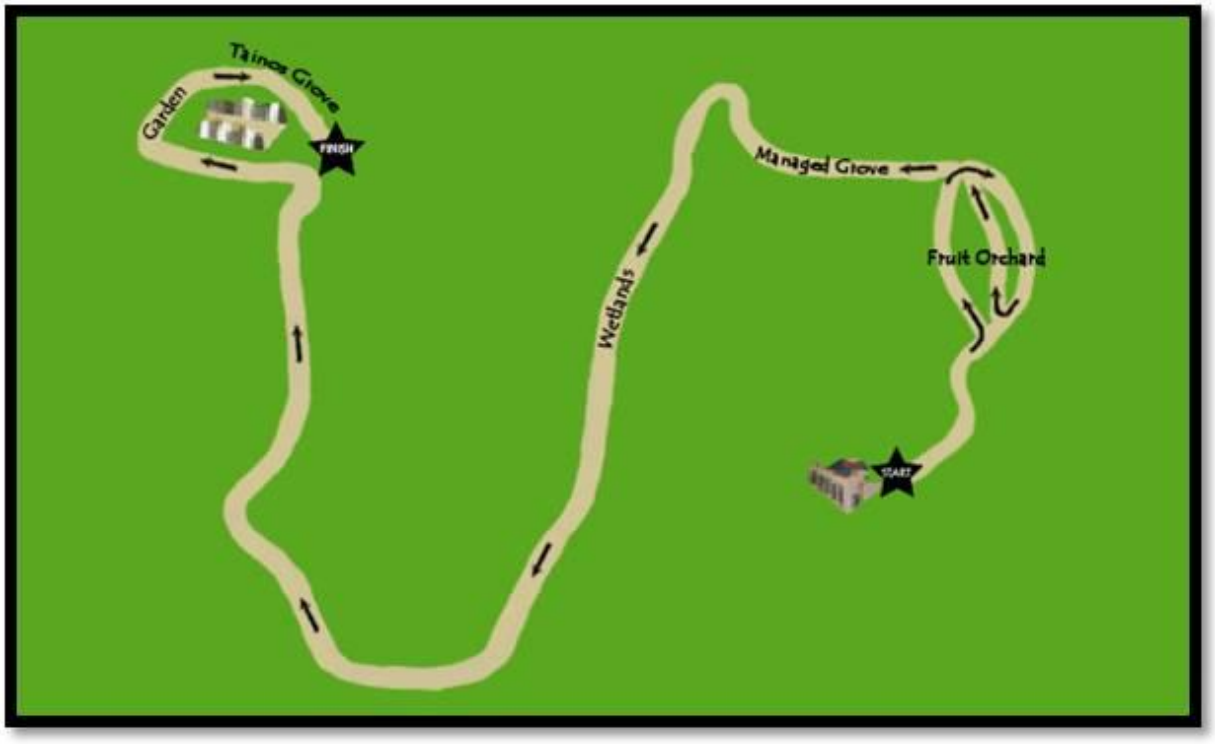


Figure 1: Map of FoRTS

The FoRTS starts at the garden's museum and ends with the Taíno grove. This new trail was the first step in designing an interpretive program for the CBCG.

The main focus of this project was the creation of interpretive stories. Written for the perspective of a ten-year-old, each story was designed to help the visitor visualize him or herself as a Taínos child interacting with the environment. There are a total of 25 interpretive stories, the first four of which can be seen below:

> ***Guava*** *- You sit on a low branch of a guava tree and you bite into the sweet insides of its fruit. You enjoy the guava tree and are glad that it grows so close to home, in the guada. Your parents warn you about the spirits or Opia that feed from the Guava tree at night. The juice runs down your chin just as your father approaches the tree. He cries "Opia" as he pulls you from the branch. You giggle and point to your belly button to show him that you are not a spirit, but his daughter. [Keegan & Carlson, 2008, p.79, 112]*
>
> ***Cashew*** *- You walk through the conucos, the ripe yellow and red Cashew apples catch your eye. You sit under the tree and eat the Cashew apples from the low branches and save the nuts for your mother. In a basket made from the leaves of the Maguey plant, you decide to bring back some fruits to the village. You can't wait to get home to roast the nuts with your mother. [Glogiewicz, Personal communication, April 14, 2010; Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.286; Fewkes, 1907, p.213]*
>
> ***Guanábana*** *- Imagine you are a Taíno girl, you like the Guanábana tree that stands in the guada. When your mother gives the tree extra care, the fruit grows larger than your head! You are too scared to sit under this tree because the spiky fruit looks like the puffer fish that the fishermen bring to the Behique for his ceremonies. But as the fruit ripens, the spikes curl up and disappear, and you are not afraid to touch it.*
>
> *Your mother opens up the fruit so the family can enjoy the tasty white insides. She tells you that the leaves are poisonous and to stay away from them, just like you stay away from the puffer fish. Sometimes you see your mother rub the leaves into your brother's scalp to kill off the itchy lice. You hope that your mother does not have to do the same for you! [Keegan & Carlson, 2008, p.79, 114; 4][Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.100]*
>
> ***Jobo*** *- You pick a golden fruit from the Jobo tree. You turn the fruit over in your hands. It reminds you of a story that your mother used to tell how the sun turned a group of fisherman into the Jobo tree. [Arrom, 1998, p. 72; Fewkes, 1907, p.74]*

The interpretive stories needed to be available to the visitors of the garden. To accomplish this objective, the team designed a guided brochure that contained all 25 interpretive

stories, a map of the FoRTS, and a list of 52 indigenous plants found on the FoRTS with their usages. The team hopes that visitors of the garden will be able to receive a guided brochure to accompany them on their tour of the FoRTS.

A plant list was also created by the team that provides a detailed description of important plant species seen on the FoRTS. The table contains each plant's common name, scientific name, and Taíno name if applicable. The usages of the plants are also included. An example of the plant list can be seen below:

Table 1: Example of Final Plant List

List of plants and usages in Caguas Botanical and Cultural Garden

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taino use Jibaro use	Food*	Medicine *	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Flower Orchard										
Ceiba *Ceiba pentandra*	Seed capsules mature in spring and summer[1]	Can be made into drums. Additionally, plants and other trees grow in the shade of this tree.[1]	Tainos used the tree for drums and canoes. [2]			Wood- ***drum, canoe***		Tree -*shade*		[1][Little & Wadsworth, 1964, p.332] [2][Keegan & Carlson, 2008, p.112; Glogiewicz, Personal communication, March 16, 2010]
Maga[3] *Montezuma speciosissima*	Flowering and fruiting throughout the year.[1]	Used for furniture, musical instruments, posts, and poles. [1]	The Tainos rubbed the wood together to make guatú (fire). [2]			Wood- *musical instruments, post,* ***fire maker***		Wood- *furniture, pole*		[1][Little & Wadsworth, 1964, p.328] [2][Glogiewicz, Personal communication, March 16, 2010]

This table was used throughout the development of the interpretive stories. The three deliverables are:

- A plant list
- A set of interpretive stories
- A guided brochure

After completing the results, a list of future recommendations was created. These suggestions could either be completed by the CBCG, or done by a future project group. The recommendations include:

- An identification sign for each plant in the garden
- Interpretive panels
- A translated website
- Proposal for future publications of the guided brochure
- Additional trail systems

The team hopes to increase the visitors' environmental literacy and to enhance the CBCG's mission by designing an interpretive program, comprised of a plant list, interpretive stories, and a guided brochure.

Chapter 1 Introduction

Puerto Rico has not experienced political independence since the early 1500's, during the height of the Taínos civilization. The Taínos, one of the first indigenous tribe of Puerto Rico, developed a simple fishing and farming community, and lived peacefully for hundreds of years. The Western world was first introduced to Puerto Rico when Spanish explorers landed on the island and began settlements. Spain claimed Puerto Rico and brought African slaves to fuel the development of the sugar cane plantations and to build military and trading posts.

Throughout Puerto Rico's history, each new ethnic group has brought with them a separate identity. These distinct identities have blended into one unique culture known as the Creole. The Taínos, Spanish, and Africans all contributed to the traditions, religion, laws, and social infrastructure currently present on the island. Puerto Rico has undergone political, social, and economical changes and developments in the years following its settlement by the western world. However, Puerto Ricans still maintain a strong pride in their connection to these three original cultural groups.

In an effort to preserve its history and landscape, the island is following the general movement towards region-specific environmental education. This movement is particularly important in Puerto Rico, where the plant population is as diverse as the people. The island is home to hundreds of plant species both indigenous and foreign to Puerto Rico. Successful preservation of the natural environment will require the effort of the entire island.

The Caguas Botanical and Cultural Garden (CBCG) is situated in Caguas, a city in the interior of Puerto Rico, 30 minutes south of San Juan. The area was a sugarcane processing mill before it was opened, by the local government, as a botanical garden in 2007. The garden

contains 60 acres of controlled land with an additional 600 acres of uncultivated forest. The CBCG is home to over 250 species of plants as well as several archeological sites, some as recent as the ruins of a 19th century sugarcane processing mill, while others date back to the stone carvings of the Taíno people. The plants in the garden are used by the CBCG to facilitate learning about the local heritage. Throughout nine distinct groves, the visitors see many indigenous plant species used by the Taínos, along with plants that were brought in later from Africa and Asia. On their website, the CBCG states that the garden is "designed to educate the public about Puerto Rican culture in relation to nature and tropical agriculture" [Jardín Botaníco Cultural de Caguas [JBCC], 2007b.]. This project is guided by the mission of the CBCG to enhance the visitors' environmental literacy.

The goal of the project is to educate the visitors of the CBCG on the Taíno lifestyle and their relationship with the ecosystem, while enhancing the visitor's curiosity to learn about living more harmoniously with nature. The team developed interpretive stories that are included in a guided brochure in conjunction with the Back to our **Fo**rest **R**oots **T**rail **S**ystem (**FoRTS**). This new trail includes over 200 plant species, archeological sites, and remnants of the Taíno culture such as petroglyphs, stone carvings, and indigenous plant species. A plant list documenting 128 plants found along the trail was created and used to inspire 25 interpretive stories depicting how the Taínos' incorporated plants into their lifestyle, culture, and legends. This was accomplished by researching the Taínos' uses of different plants within their society. The team's goal was that visitors of the CBCG would leave the garden with information on the diverse environment of Puerto Rico, and be inspired by the relationship between the Taínos and the natural world. To accomplish the objectives, the team conducted interviews with onsite experts, performed field expeditions within the botanical garden, and compiled research from online databases, libraries,

and documents provided by the sponsor. It was the team's hope that this project would enhance environmental literacy, and to help the visitors realize the importance of defending the natural world.

Chapter 2: Literature Review

This chapter begins by examining the development of the Creole culture and the history of Puerto Rico. The first section provides insight into the social history of the island, looking at three specific ethnicities; the Taínos, the Spanish, and the Africans. The subsequent section outlines the existing programs at the Caguas Botanical and Cultural Garden (CBCG), the layout of the garden's educational areas, the history of the region, and the missions of the botanical garden. The next section focuses on the cultural importance of the plants located in the garden. This segment not only looks at the plants current significance, but also reviews their usages by indigenous tribes, in particular the Taínos.

Section 2.4 emphasizes the importance of a natural setting for environmental education and establishes a definition of environmental literacy in both children and adults.

In the final section, the team explored the characteristics of a successful interpretive program. This provides an understanding of the elements that help people retain information and concludes with guidelines for developing effective interpretive stories and brochures.

2.1 History of Puerto Rico as a Settlement

The island of Puerto Rico, approximately 3,515 square miles in size, is home to nearly four million people of mixed race and culture ["Puerto Rico", 2010]. One of the most prevalent cultures on the island is Creole, a blend of the three early cultures of Puerto Rico. The Taíno people were one of the first inhabitants of Puerto Rico, living peacefully for hundreds of years before the arrival of the Spanish. When the Spaniards arrived they restructured the island to make it more valuable for trade and agriculture for the Western world. With the help of the African slaves, the new ethnic group added diversity to the Creole culture. These ancestral

groups are important components of the modern Puerto Rican identity, as many current residents have relations to multiple ethnicities.

2.1.1 History of the Taínos

The Taíno tribe was the first established civilization on the island of Puerto Rico. They originated from the Arawak tribe who were native to present day Venezuela [Figueroa, 1996]. The Taínos named the island "Boriquen", meaning "the land of the brave men" [De Leon, 1974, p.3]. Taíno words and their meanings can be found in Appendix J. This indigenous group consisted of peaceful people focused on family, farming, fishing, and hunting.

The Taínos lived in villages called yucayeques [De Leon, 1974, p.3]. The structure of these towns was similar between villages. The community was based around a central plaza, while tall walls and watchtowers surrounded the exterior of the town. The yucayeques were usually built near a water source, with a road connecting it to the center of the town [Figueroa, 1996]. Each village consisted of many comparable houses that were adorned with similar furnishings. The principal furniture in each household was a hammock, which was made primarily from woven cotton. Along with hammocks, other woven ornaments, such as belts and baskets were commonly found within households [Fewkes, 1907, p.213].

Figure 2: Yucayeques in Caguas Botanical Garden [JBCC, 2007a]

Baskets were utilized at home and in the community. Primarily made from palm branch cord, baskets were used for gathering, storage, and as a repository for ancestors' bones in Taíno homes. The Taínos believed that the soul lingered in the bones of the dead, and their treatment of ancestral remains demonstrates the Taínos' sense of tradition and respect [Figueroa, 1996].

The Taínos' social structure consisted of two classes; the Nitaínos-the noble ruling class, and the Naborias-the lower working class. A naguas, a frontal apron worn by married women, was the main clothing worn by the Taíno people besides the Cacique's skirt [Fewkes, 1907, p. 213]. The length of the naguas was directly proportional to the social ranking of the women. The Caciques, or chief, came from the Nitaínos class. This position is passed to the Cacique's sister's eldest son or daughter if no son exists. Class and rank were passed down through the maternal line rather than paternal ancestry that is more common in many cultures. Due to this maternal heritage, male chiefs would often have multiple wives to gain higher social status or to create alliances between villages [Figueroa, 1996].

Throughout the village, the roles of men and women were well established. Males provided for the tribe as fishermen and hunters. Although the fishermen would often fish with canoes and nets, the Taínos employed other fishing techniques that included poisoning the water to paralyze the fish, enabling them to be captured by hand. In addition to marine and freshwater animals, the men hunted small prey such as iguana, wild birds, and small rodents. The women's responsibilities were found closer to the yucayeques, where they would cultivate crops, care for the family, and make pottery and baskets [Figueroa, 1996]. The Taíno women cultivated guada, or home gardens, for everyday use, while traveling farther from the village for conucos, or slash and burn fields [Keegan & Carlson, 2008, pp.71-72]. Although women had strong roles in daily activities, they did not have a significant role in ceremonies.

Elaborate celebrations were an intricate part of the Taíno society. These celebrations included dance, music, and feasts [Figueroa, 1996]. These festivities, called Areytos, were often of religious significance and were held on a variety of occasions, from a death to the visit of an important guest. During these ceremonies, the Taínos would cover themselves with colorful body paints and parrot feathers. The Areytos often lasted several days and included "…tribal histories, genealogies, tales of great conquests and battles. Mock battles and ball games [were also present]" [Figueroa, 1996]. An important part of the ceremonies was the use of a hallucinogenic, where the chief inhaled ground cojóbana seeds as they believed that this would enable them to communicate with the spirits and their ancestors [Figueroa, 1996].

Figure 3: Petroglyph in Caguas Botanical Garden [JBCC, 2007a]

The Taínos were polytheistic, with religion and tradition incorporated in every aspect of their lives. Legends were told depicting stories of their gods and spirits, along with the origin of the world. A compilation of the documented legends can be found in Appendix C. The characters in the legends were frequently portrayed through petroglyphs, the only form of Taínos written language. The petroglyphs (see Figure 3) were simple drawings engraved into the stones. These stone carvings can still be seen throughout Puerto Rico. Since the Taínos believed the spirits rested in the water, the petroglyphs were often carved near rivers and streams where the reflection from the water was viewed as a communication channel to the spirits of the dead [Jeffery Glogiewicz, personal communication, March 16, 2010].

Another place where petroglyphs were found was around the Batey court where ceremonies were held. The court was where Taínos played a ball game called Batey. This game used a rubber ball made from the gum of the cupey or bulletwood tree. It is interesting to note that the first time that Europeans noticed rubber was when they arrived in the early 1500's [De Leon, 1974, p.4].

2.1.2 Spanish Discovery of Puerto Rico

On his second trip to the Americas, Christopher Columbus landed in Puerto Rico on November 19, 1493. The Spanish began to settle the island in the early 1500's, bringing with them European diseases, such as small pox. Most Taíno natives died due to a lack of immunity to these diseases, and those that survived assimilated into the Spanish culture and were forced into slavery, or escaped inland to the mountains. The Spanish settlers who inhabited the island brought no women with them and eventually intermarried with the Taíno women [De Leon, 1974, p. 3; Fewkes, 1907, p.53].

Figure 4: San Cristobal - Old San Juan, Puerto Rico [National Park Service, 2009]

In 1509, the King of Spain appointed Ponce De Leon as the first governor of Puerto Rico. With his appointment, the name of the island was changed to "The Island of San Juan Bautista" [De Leon, 1974, p.4]. This name change is just one example of the impact of the Spanish on the small island's culture and language. Spanish became the dominant language, accompanied by a shift from polytheism to Roman Catholicism. Due to the influx of Spanish culture, churches and

plazas became the center of the towns, and the local structure of the island was transplanted from the yucayeques system of the Taínos [De Leon, 1974, p. 7].

Previously, the Taínos picked the gold from shallow streams and then pounded it into a foil to cover their jewelry and other artifacts [Figueroa, 1996]. The Spanish first noticed the presence of gold on the island in this ceremonial jewelry. In order to export gold from the island, the Spanish were completely reliant on the forced labor of the Taíno people; this process continued until the gold resource was exhausted.

San Juan Bautista changed the name of the island to Puerto Rico, meaning rich port, in 1521 and it remained an important part of the Spanish empire as a strategic military and economic position connecting Spain's territories. To defend the island, the Spanish built the elaborate walls of El Morro, in the 1540's and San Cristóbal, in 1634 to protect its main port of San Juan [De Leon, 1974, p. 7; National Park Service, n.d.].

As the Spanish settlers continued to develop Puerto Rico, they were separated into two distinct classes, similar to the social structure in the Taínos' culture. Plantation owners were both rich and powerful, while the Jibaros were poor, less influential, and lived on small farms [De Leon, 1974, p. 8]. Although poor, the Jibaros were a very proud people, who judged a man's worth not on his monetary wealth, but rather on "the spiritual qualities of personal honor and family respect" [De Leon, 1974, p.10].

2.1.3 African Slaves

In 1509 Ponce De Leon brought the first African slaves to the island. As cotton, coffee, and sugar cane plantations developed in Puerto Rico, the demand for more slaves increased. The African population grew as a result of the slave trade [De Leon, 1974, p.7]. The movement to

end slavery started in 1664 and lasted 209 years, until slavery was completely abolished in 1873 [De Leon, 1974, p.7]. The Africans brought their culture with them to Puerto Rico, leaving an enduring effect on the island and its people. These impacts can be seen in dance, music, and other ceremonies still performed on the island [De Leon, 1974, p.6]. African influences can be seen in Puerto Rican dances such as the Plena and the Bomba [Smithsonian Institution, 2010]

The African, Spanish, and Taínos cultures merged to create the Creole culture that can still be seen today. All three cultures had lasting impacts on the island; in particular the Taínos had a lasting impact on the language, art, and the traditions of the island. Although few Taíno artifacts remain, some pottery, both elaborate and unique, utilizing red pottery with white details still exists. Taínos art is well preserved through the petroglyphs that have survived for hundreds of years and can be seen throughout Puerto Rico. Many Taíno words are used today in a variety of languages, such as barbeque and hammock. The African and Spanish people also impacted the small island's food, religion, and social structure. Although Puerto Rico has been a U.S. territory since 1898, and has experienced strong influences from Spain and America, it retains a unique population and culture.

2.2 Caguas Botanical and Cultural Garden

The Caguas Botanical and Cultural Garden (CBCG), situated in the interior of Puerto Rico, is just a 30 minute drive south from the capital city of San Juan. Located in the city of Caguas, the garden enjoys a year round tropical climate that is ideal for plants that flower and fruit throughout the year. The garden contains 60 acres that were once part of a large sugar processing mill. The CBCG was designed to educate the visitors about "Puerto Rican culture in relation to nature" as well as "tropical agriculture." Founded by the Caguas municipality in 2007,

the garden has been serving Puerto Rico as a place for visitors to learn about Caribbean history in a natural environment and to realize the importance of defending the natural world [Glogiewicz, Personal communication, January 21, 2010]

The CBCG is composed of nine separate groves: the Taínos ancestral grove, the African ancestral grove, the timber grove, the palm grove, the fruit grove, the artisan grove, the ornamental grove, the flower grove, and the wetlands. Each one of these groves is a distinct trail, leading the visitors from one point to another through a themed habitat. Currently, no organized trail system exists to take the visitors through a self-guided tour. Two other educational sites are found on either side of the garden, the Jibaros house and the museum. The museum focuses on the early indigenous people, while the Jibaros house educates the visitors on the practices of the early Spanish settlers. Other garden resources available to the visitor include: ancient genuine petroglyphs, numerous petroglyph reproductions, and the ruins of a sugar cane processing mill. These additional structures help the visitor feel the historical presence of the Taínos, the Africans, and the Spaniards [Glogiewicz, Personal communication, January, 21, 2010].

The garden is currently open four days each week, Thursday to Sunday from 10 am to 4 pm. Mondays are reserved for maintenance, while Tuesdays and Wednesdays are designated for field trips from schools and summer camps. Currently, three different tours are offered including the Tour of the Historical areas, the Tour of the Archaeological sites, and the Agro Tour. The Tour of the Historical areas takes the visitor to the Old Mill and explains the production technologies used in the early 1900s [JBCC, 2007d]. The Tour of the Archaeological sites includes information on indigenous people of this area and takes the visitors through the local findings of these people. Lastly, the Agro Tour gives the visitor a chance to learn about

"sustainable developments" in agriculture [JBCC, 2007d]. The CBCG offers a wide variety of tours intended to reach as many people as possible, and to create lasting impressions that will positively impact the environment [JBCC, 2007d].

2.3 The Use of Plant Species by Taínos

Similar to the creation of the Creole culture, Puerto Rico's environment has developed from various parts of the world. A wide variety of plant species thrive in the island's habitat, where approximately 500 species of plants can be found. Many of the plants that were important to Taíno culture were indigenous to the West Indies and Central America. A majority of these species were brought to Puerto Rico from the Dominican Republic [Liogier & Martorell, 2000].

Figure 5: Image of CBCG [JBCC, 2007c]

The Taínos utilized many of the plants found in the garden during their prosperity in Puerto Rico [Liogier & Martorell, 2000]. The CBCG records indicate that about 50 percent of the plants grown in the garden were once used by the Taínos [Jeffrey Glogiewicz, personal communication, February 12, 2010]. They utilized the surrounding plants for a variety of purposes. The Taínos employed plants for food, medicine, tools and weapons, clothing, and shelter and construction.

A number of plants species were important food sources for the Taínos. Peppers from the malagueta tree were very common ingredients in Taíno cooking [Austin & Honychurch, 2004], as were avocado, guava, and papaya [Glogiewicz, Personal Communication, and February 12,

2010]. Fruits plants were not the only plant species that Taínos relied on for food; yuca and many other root plants were cultivated and cooked by the Taínos as important sustenance [Keegan & Carlson, 2008, p.72-73]. The detail of the cassava bread-making process that uses the yuca roots can be seen in Appendix A.

Medicinal applications of plants were also prevalent in Taíno culture. Some examples of such plants are the tártago emético, almácigo, and cojóbana trees. The tártago emético flowers were employed as a natural laxative [Allsworth-Jones, 2008]. The almácigo helped to alleviate stomachaches and diarrhea by having the individual drink a broth concocted from the tree's leaves, bark, and resin [Rodríguez & Robineau-Germosén, 2009]. Furthermore, the cojóbana tree's seeds were often applied in general medicine as a painkiller; they were also used as a mind-altering drug. During Areytos, the Taínos would grind the seeds from the cojóbana tree into a hallucinogenic powder, cohoba, which was snorted in order to communicate with their gods and ancestors ["Cojóbana", n.d.].

The Taínos relied on plants for the creation of their weapons and tools as well as musical instruments. A weapon that the Taínos used was the macana, a club made from the palma real [Glogiewicz, Personal communication, March 16, 2010]. For fishing, the chambibe tree was employed because the seeds are toxic to fish. When the powder of crushed chambibe seeds was placed in the water, the fish were paralyzed and could be caught by hand [Little & Wadsworth, 1964, p.308; Benedetti, 2007]. As for ceremonial musical instruments, the Taínos created the maracas, from the fruit of the higüero tree [Glogiewicz, Personal communication, March 16, 2010].

The main clothing worn by the Taínos was the naguas. Due to the association between the naguas and social ranking, the dyeing and decoration process was important to the married

women. As for the Taíno men, only kilts worn by the Cacique are mentioned in the research literature [Fewkes, 1907, p. 213]. Achiote seeds, known today for their property as food coloring used in rice, were pounded into a red dye by the Taínos [Keegan & Carlson, 2008, p. 79; Glogiewicz, Personal communication, March 16, 2010]. Guama americano tree bark was another dye that created a yellow pigment [Little & Wadsworth, 1964, p.162]. Blue-black dye was also a common component in clothing decorations. This dye came from the fruits of jagua tree [Little & Wadsworth, 1964, p.70; Glogiewicz, Personal communication, March 16, 2010].

The Taínos also utilized plants for construction, for example the palma real was used for building the walls and floors of their houses [Fewkes, 1907, pp.44-45; Glogiewicz, Personal communication, March 16, 2010]. On the other hand, the ceiba tree was hollowed out and made into canoes. This tree in particular was useful because it was lightweight and the height of the tree could reach upwards of a hundred feet ["Silk", n.d.; Keegan & Carlson, 2008, p.112; Glogiewicz, Personal communication, March 16, 2010]. In addition to canoes, the Taínos may have also built boats from trees such as the roble blanco [Little & Wadsworth, 1964, p.498].

The Taínos relied heavily on the natural world for the things that they needed to survive. Consequently, the Taínos learned to respect the world around them and to live harmoniously with the environment.

2.4 Importance of the Natural Setting for Environmental Education

The goal of environmental literacy is to recognize the ecological system as a whole and to practice preservation of the system within one's everyday habits. This project's goal was to work within the CBCG to increase the environmental literacy of the visitors, by enhancing their understanding of the surroundings and conveying the importance of protecting it. An

environmentally literate populace "will have the knowledge, tools, and sensitivity to properly address an environmental problem in their professional capacity, and to routinely include the environment as one of the considerations in their work and daily living" [Nair et al, n.d.]. The CBCG hopes to create a lasting bond between the visitors and the natural world.

David Orr states that the common education system is more likely to be specialized than generalized [1992, p.87]. He believes, that due to the segmentation of the education system, some people could struggle to make connections between disciplines of study. This disadvantage may deprive the public from making relations between their schooling and its applicability to the natural world. As a result, some people may not know how to utilize their education in the preservation of the environment. For example, a mechanical engineer may not consider emissions in the design of a new product because they may not take into account the environmental implications. Therefore, a goal of this project is to help the CBCG engage visitors to connect their own knowledge to the world around them.

David Orr also argues that environmental literacy can be difficult in modern society because education is now isolated from the natural world [1992, p.87]. He believes the newer generations have less contact with nature, not only in their education, but in other aspects of their lives as well. Children between the ages of eight and eighteen are being pulled away from nature by modern technologies [Driessnack, 2009, p. 73]. This decrease in outdoor activities is due in part to parents' fears for safety, a reliance on technology, more specialized job training, and the busy lifestyle of the newer generations [Louv, 2005, p.13]. Children with strong curiosity may still try to find opportunities to explore the natural world. However, regulations associated with the preservation of the environment, have reduced the amount of natural space accessible to the

public [Louv, 2005, p.28-29]. The lack of access to nature makes the process of connecting people with the environment a more difficult task.

Another point that David Orr mentions is that "without rich and meaningful opportunities to bond with nature, young children may develop an aversion to, rather than infinity for their natural surround[ing]s" [Wells & Zeece, 2007, p.286]. Without playing in the natural world, children lose the opportunity to interact with the environment and may struggle to appreciate nature later in life. The CBCG strives to provide children and parents with an environmental education and a safe natural experience in which to interact with the outdoors. This research seeks to create an environmental educational program that is both accessible and inspirational.

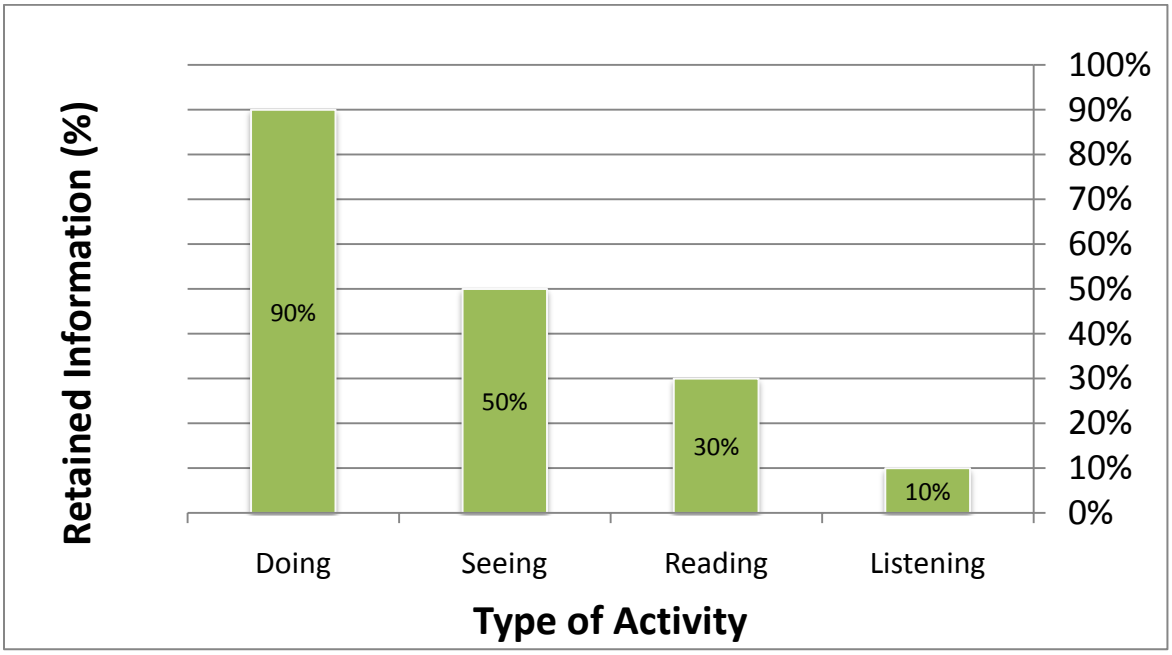
2.5 Designing an Interpretive Program

Interpretive programs are important tools employed by national parks and historical sites. They help the visitors to process and understand the observed surroundings during their visit. Interpretation "seeks to make connections between historical places and history, between the lives we lead today and the lives that once filled these spaces. While the ultimate goal is to encourage an appreciation of the importance of historic places and a commitment to preserving them for future generations" [Thomson &Harper, 2000b]. The goal of this project is not only to teach about the indigenous lifestyle, but also to enlighten the visitors about the importance of plants, and to motivate them to preserve the environment. By appreciating the Taínos' approach to living with nature, the guests to CBCG can learn to interpret nature and come away with an appreciation of the importance of protecting nature. It is believed that "through interpretation comes understanding; through understanding comes appreciation; and through appreciation comes protection" [Taylor, Barthuli &Sharon, 2005].

There are many aspects to be considered when developing interpretive programs. Programs are most successful at a historical venue that "possess [es] meaning and has significance," and provides a place where the visitor will be "seeking something of value for themselves". If both of these are true, then interpretation can "facilitate the connection between the interests of the visitor and the meaning of the resource" [Thomson &Harper, 2000b].

Freeman Tilden explains the importance of using different tools during interpretation. He states that interpretation should "reveal meanings and relationships through the use of original objects, by first-hand experience, and by illustrative media" [Freeman Tilden, 1977, p.8]. Using different media, the purpose of an interpretive program is that the visitor will remember and apply their newly attained knowledge to their everyday life. Dr. William Lewis studied park visitors and how they retain information [1988]. Table 1 graphs one of his key results.

Table 2: How People Retain Information [Lewis, 1988]



Based on these findings, the most effective form of education occurs when the visitor is involved with hands on activities. Similarly, a study entitled *Recommendations for Royal*

Botanical Gardens Educational Services states "hands-on activities allow the students to get „in-tune' with the topics and learn through involvement with the activity" [Jeanne, Donovan & Thompson, 2005, p. 23]. From these studies, it is important to compliment information presented with interactive activities. These activities can be provided through interpretive elements. Furthermore, Dr. Lewis' study shows that 50 percent of information is retained from seeing and 30 percent from reading. Interpretative programs can be delivered in a variety of forms, including both seeing and reading.

Interpretive stories and a guided brochure were selected for this project because they utilize three important characteristics outlined in this chapter. The visitor will read stories, feel a personal connection to the story at hand, while seeing and possibly touching the plants and landmarks. Although some guests may misinterpret a personal guided brochure, it is by far the best medium to provide information for different demographics. Another advantage is that it can easily be updated and edited with new information [Thomson &Harper, 2000a]. Used together, these interpretative elements will provide the visitors with a sense of history and engage them in the preservation of the environment.

2.5.1 Interpretive Stories

The key element of interpretive stories is that the visitor should not be provided with an interpretation. Instead, the experience should be happening directly to the visitor [Taylor, Barthuli & Sharon, 2005]. In this fashion, the visitor can make an emotional connection with the natural surroundings of the CBCG. Therefore, it is important to use emotions and concepts that are universal such as, "family, community, safety, fear, love, death, hate, survival, etc" [Taylor, Barthuli & Sharon, 2005].

To ensure that this connection is made, it is necessary to consider the style of the narrative. The voice of the story is an essential component to make a personal connection with the audience. Using second person will establish a connection between the reader and the location. Since the reader is being addressed as "you", they feel as though they are the main character of the story ["Writing", n.d.]. It is also important to couple this technique with the passive verb tense so the visitors are reading as if they themselves are doing the action. An example of this technique is, "you discover" as if the reader was presently participating in the activity. A third principle outlined by the Scottish National Heritage, is to use "metaphors, analogies and comparisons". This method is of particular importance because the reader may not be familiar with the subject matter, so it is essential to relate it to something more universal ["Writing", n.d.].Two other skills that engage the reader are using humor and asking questions. Both of these practices have been shown to make the experience of reading the story more enjoyable ["Writing", n.d.].

The team found a story that followed similar guidelines to these:

> *Ouch! Like you, trees can get sick or hurt. When bark is injured through such thoughtless acts as hammered nails, broken branches, and carvings, harmful insects and diseases can easily enter the tree. Look at the oak tree behind this sign. Does it look healthy? What signs of injury do you see? Please help forest trees stay healthy by not using nails, carving bark, or breaking branches. You'll help them stay around a lot longer to provide shade, scenery, and wildlife homes and to protect soil from erosion [USDA, US Forest Service, n.d.].*

This story uses "you" as if the reader was being spoken at directly. It also uses questions and feelings that are universal such as being sick, so the reader is able to easily relate to what the story is conveying.

In general, interpretive stories should be no longer than 200 words each. This keeps the reader engaged in the story, while not interfering with the visitor's experience ["Writing", n.d.]. Given the short length, it is important that the stories get to the core ideas quickly [Trails to Build, n.d.]. The information should be presented in "short sentences and paragraphs" ["Writing", n.d.]. Interpretive stories should be written to the "reading age" of a nine to twelve year old which will appeal to most children as well as adults. This writing style must be less complex and include as few scientific terms as possible. By keeping the story in an easy to understand language, it is more likely to influence the majority of people. When using technical terms, one runs the risk of estranging the visitor ["Writing", n.d.].Creating interpretive stories following these guidelines should yield captivating and educational stories that could be displayed in a guided brochure.

2.5.2 Brochure

A well-designed brochure can replace a tour guide and allow the visitors to enjoy the area at their own pace. A poorly designed brochure may have the opposite effect, leaving the visitor confused and frustrated. This section outlines the important principles of successful brochure design, along with several case studies from Plimoth Plantation and San Juan. Together these guidelines should ensure the final brochure is strong and is easy to read.

2.5.2.1 Brochure Guidelines

Most brochures follow very simple, yet effective, design guidelines. By following these, one can create a successful brochure that is designed for a specific target audience and adheres to the guidelines for layout and design. Determining the target audience is the first step towards creating an effective brochure.

2.5.2.1.1 Brochure Audience

According to research done by The University of Queensland, the most effective brochures are aimed "toward a 5th grade reading level, approximately 10 year olds" [The University of Queensland [UQ], 2006b]. This focus on a specific audience needs to be considered in the main text of the brochure. The headlines and topics must summarize the main text and be easy for the reader to comprehend. A straightforward step to achieve this goal is to minimize the use of overly complex scientific words or phrases.

2.5.2.1.2 Brochure Layout

After the consideration of the headings in the brochure, the layout of the brochure can be designed. First, the size of the paper must be determined; this decision is mostly based on personal preference, design considerations, and budget [Duermyer, Randy, n.d.]. The printing dimensions of the brochure should be determined in advance to ensure proper representation of the text and graphics. Additionally, print bleeding, an extension of the graphics over the intended margins to account for cutting concerns, needs to be addressed when designing the layout of the brochure. It is recommended to increase the color or picture an extra 1/8th inch beyond the margins of the brochure to allow for variations during the cutting process [Duermyer, n.d.].

2.5.2.1.3 Brochure Folding

The main difference between brochure designs is the way they are folded. Folding can act as a moderator in the story telling, showing the reader information in the order the author wishes to present it. The examples of different layouts are numerous but there are several commonly used designs. In brochure design there are two major folds, the "C Fold" and "Double Gatefold" as shown in Figures 6 and 7, respectively. "C Folds" have bigger but fewer panels where

"Double Gatefolds" have smaller panels. The "Double Gatefolds" require the inside fins to be between 1/32nd and 1/16th of an inch smaller than the outside fins to allow for easier folding [Bear, 2010a; Bear, 2010b].

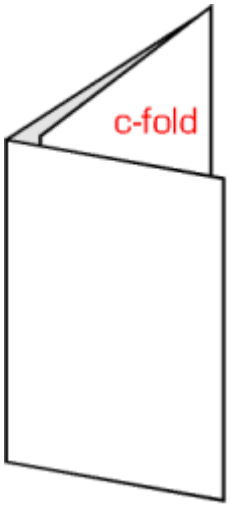


Figure 6: C Fold [Bear, 2010a]

Figure 7: Double Gatefold [Bear, 2010b]

2.5.2.1.4 Brochure Graphics

If the guided brochure is being designed to replace a tour guide, it should include a diagram or map directing the visitor along the designated route [UQ, 2006a]. Without a diagram or a map, the visitor is likely to get lost. Additionally, the diagram or the map should be clearly labeled and numbered to easily match any features being described in the brochure [UQ, 2006a]. Blurry images can be unreadable, often discouraging people from using the brochure. The diagram or map should be of high resolution and graphic quality to avoid this issue [Duermyer, n.d.].

The design of the brochure should consider the logo of the company; in this case the CBCG. The use of the company's logo in the brochure is important; one should "avoid using the logo as a design element (for example, using it as a whole page background element)" and "size it appropriately to the layout" [Wenger, 2007]. In short, the logo should not be the main focal point of the brochure.

A three-color palette should be used throughout the brochure consisting of the brand, the primary, and the secondary palette. The brand palette consists of colors found in the logo. For a CBCG brochure this would be composed of mainly greens and browns. Colors complimentary to the brand palette make up the primary palette, while the lighter shades make up the secondary palette [Wenger, 2007]. The brand palette should be used sparingly because including too much of these colors will "camouflage the logo rather than enhance it" [Wenger, 2007]. White might not be in any of the palettes, but it is still very important because it helps enhance the other colors [Wenger, 2007]. A good color selection for the brochure, greatly enhances the quality of the material presented to the visitor and should be considered with care.

2.5.2.1.5 Brochure Text

The main text has a large impact on the readability of the brochure. To make the brochure easy to read, the text should be in a serif font (i.e. Times New Roman) and not in a sans serif font (i.e. Arial). The font should be uniform throughout the brochure. Text should be in a large font and well spaced to produce better readability. Furthermore, the text color should clearly contrast the background. This can be achieved by having dark text on a light background [UQ, 2006b]. In addition to the proper way to present the text, sentences should be short and simple, including no more than 15 words. Each line in the brochure should have between 40 and 65 characters [UQ, 2006b].

Following these rules and guidelines lead the team to the development of a well-designed brochure. Additionally, the team looked at examples of brochures to assure no key attributes are forgotten.

2.5.2.2 Guided Brochure Case Study

Two brochures were considered from Plimoth Plantation: *Voice of the Land- The Path to the Wampanoag Home site*, and *A Guide to the Museum*.

The *Voice of the Land* brochure displays a journey to the Wampanoag Home site through the local geography and can be seen in Appendix H. At each point of interest, there is a brief story of the Wampanoag's relationship. The story is broken down into six steps, which take you through a journey similar to the product the team delivered. The brochure is easy to read and aesthetically pleasing.

A Guide to the Museum included more information on three different historical sites. The brochure includes a map of the settlement and home site, along with a map of the Mayflower.

Both are easy to read, effectively conveying large amounts of information in limited space. The brochure includes useful information for the visitor such as driving directions, handicap access, and a common question and answer section. The brochure was intended to facilitate a self-guided tour. Since the brochure is printed on thinner paper with far less color, it would be much more cost efficient to produce.

Another brochure from San Juan, Puerto Rico called the *Forts of Old San Juan* was examined and can be seen in Appendix I. Broken down into three sections, this brochure discusses specific areas of interest, such as El Morro and San Cristóbal. Each section includes pictures and text. At the bottom of one side of the brochure, there is a map of Old San Juan. Identified on the map are the locations of other points of interest throughout Old San Juan. Also included is visitor parking and caution warnings. The brochure is too large, restricting vision of surroundings and utilizes both front and back, allowing for a lot of information.

Additionally, two other reviewed brochures were from the University of Puerto Rico's Botanical Garden and from the Cathedrals in Old San Juan. The main difference between the two was their use of different font styles. The *Botanical Garden* Brochure, shown in Appendix G, used sans serif font throughout the entire brochure. This font is more difficult to read and less visually appealing. The brochure called *San Juan Cathedral and Christ Chapel* can be seen in Appendix F. This brochure used both sans serif and serif fonts. The sans serif fonts were used in the titles of the sections, while the serif fonts were used for the bulk of the text. This created a very visually appealing and easy to read brochure.

From the case studies above, a hybrid brochure should be created using positive aspects of all five brochures. A map similar to the map found in the *Guide to the Museum* brochure should be included in this project. It is important for the map to be easy to understand, including

limited text so the visitor is not overwhelmed with information. The team used a serif font because they found it more visually appealing and easier to read. Pinpointed locations were used in the team's brochure to point out locations of plant species. Through these case studies the team has taken into consideration the cost of printing and the amount of graphics desired.

2.6 Conclusion

This chapter summarizes the history of the Puerto Rican culture and the integration of the three separate ethnicities to create the Creole. Specifically, this chapter examines the lifestyle of the Taíno people, the African slaves, and Spanish settlers. The Caguas Botanical and Cultural Garden has exhibits representing each of these ethnicities.

The subsequent sections of this chapter discuss environmental education and interpretive programming. This chapter also examines techniques for developing interpretive stories and a guided brochure.

Chapter 3 Methodology

The goal of this project was to increase the visitors' environmental literacy through the interpretation of the Taínos' lifestyle in the Caguas Botanical and Cultural Garden (CBCG). Field expeditions of the garden were used to develop a new trail called the Back to Our Forest Roots Trail System (FoRTS), along with a comprehensive list of plant species located on the trail. An expert interview was conducted to increase the team's knowledge of Taínos' legends, lifestyle, and culture. The team took a total of four trips out to Caguas, two of the trips consisted of three days and two nights, one trip consisting of two days and one night, and one day trip. Once these steps were completed, the team began the process of developing interpretive stories and a guided brochure. The diagram below illustrates the process of the project; it is broken down into three segments: research; acquired information; and final deliverables. Although the interview was conducted after field expeditions, when the plant list was edited information from the interview was added.

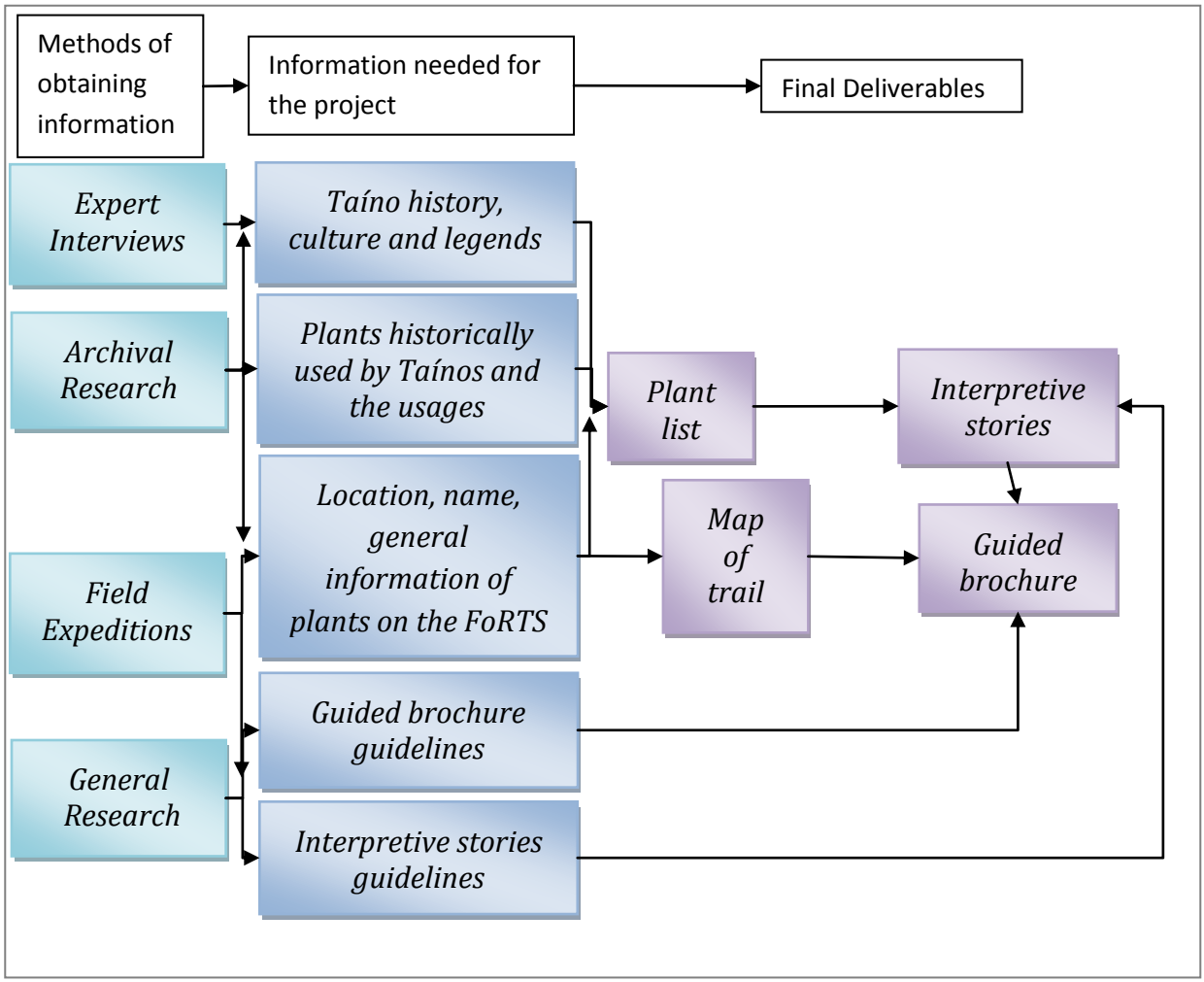


Figure 8: Flow Chart of Project

Following the above proposed project flow chart, a timeline was developed detailing when each section was executed. This timeline is shown in Table 3 below:

Table 3: Proposed Timeline of Project

	PQP	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Initial Research								
Field Expedition								
Expert Interviews								
Research								
Creation of Interpretive Stories								
Design of Guided Brochure								
Write Report								

The following sections describe the methods taken to develop the final results, starting with site analysis.

3.1 Field Expeditions

Field expeditions were used by the team to develop a new trail system, FoRTS, comprised of existing trails at the CBCG. On the first of four visits to the garden, a full examination of all parts of the garden was performed; the fruit grove, the timber grove, the palm grove, the flowering grove, the ornamental grove, the artisan grove, the African historical grove,

the Taínos ancestral grove, and the wetlands. This began with a casual walk with the sponsor in the CBCG, where the team had an opportunity to observe what the garden was currently offering to visitors, such as specific trails and tours. Currently at the garden, there are nine trails that weave their way through the nine groves. From a three hour initial hike, the team and the sponsor determined the most important groves, due to their abundance of indigenous plants, to highlight within the new trail system. The team and sponsor determined that the FoRTS would include the fruit grove, the timber grove, the ornamental grove, the wetlands, and the Taíno ancestral grove. For the purpose of this project these were renamed as the fruit orchard, managed forest grove, wetlands, pre-garden, garden, and Taíno grove.

Figure 9: Map of the FoRTS

Pictured above in Figure 9, is a map of the FoRTS. This map was created after the initial attempt to highlight the FoRTS on an existing map of the CBCG. Since the original map provided by the CBCG was of low resolution, the image became blurry when it was expanded

and did not suit the team's purpose. Therefore a new map, developed in Photoshop, containing only the FoRTS was designed. This map included grove names, landmarks, corresponding plant numbers discussed below, and the path the visitor will take. A detailed description of the methodology for creating this map can be seen in section 3.3.

On April 26, 2010, a final expedition was conducted to time the trail with a completed draft of the guided brochure. This is detailed in section 3.5.2.

3.1.1 Development of the Plant List

After mapping the FoRTS, the next step was to record all the plants that would be on the trail. The team and sponsor did this as most of the plants in the garden did not have any identification panels. The team's sponsor, Jeffrey Glogiewicz, led the field expedition and identified most of the plant species located next to the trail that were useful in the development of interpretive stories relating to the Taínos; these plants were identified by scientific or common name in a table handwritten by a team member, as seen in Table 4.

Table 4: Field Table

Name of plant, scientific or common	Number of the picture on camera	Additional notes

Two members of the team were responsible for writing down the names of the plants, along with any notes or comments made by the sponsor in the "Additional notes" column. One team member took at least one picture of each plant and additional pictures of any fruits or flowers if available. The remaining member of the team took one or more pictures of each plant for backup purposes and discussed the relevance of the plants with the sponsor, adding notes to the list. The cameras used in the field expeditions, were able to keep track of the pictures in

ascending numerical order. The photographer conveyed the number of the picture to the two team members filling out the table; this was checked throughout the expedition for accuracy by making sure that the number corresponding to the picture matched the number written in the second column in the field table. Before entering a new section or grove, the team recorded the name of the new area in its own row, according to Mr. Glogiewicz's description, and continued developing the plant list.

The trip was conducted in two sessions during the day, totaling eight hours of work necessary to completely identify all 128 plants found on the FoRTS.

3.1.2 Creation of the Plant List

From the list of plants that was created through field expeditions, a detailed table was developed, using the following chart:

Table 5: Informational Table

Plant	Flowering	General use	Food	Medicine	Tools	Clothing	Shelter	Taínos use	Picture

The table, first created in Microsoft Word, contains the names of the plants, either common, scientific, or Taíno, given by Mr. Glogiewicz in column one, while the last column contains the pictures. There were originally 165 names transferred from the field table to the information table while approximately 200 pictures were taken and transferred to the table. The extra pictures were close up photographs of the plants that produced fruits or seeds needed for accurate identification.

Mr. Glogiewicz provided two books, volume 1 and 2 of the *Common Trees of Puerto Rico and the Virgin Islands*, which were used to fill out Table 5 for each plant on the FoRTS.

Each plant has a separate row in the table. This research was used in the preparation for the development of the interpretive stories.

Two team members conducted research utilizing the books given by Mr. Glogiewicz, to match the pictures with the names recorded during field expeditions. The pictures were compared to the drawings of each plant provided in the books to ensure the accuracy of the identification. After all 165 names and pictures were correlated, the two members filled in the flowering and fruiting seasons of each plant in the "Flowering" column. Additionally, in the "General use" column, all relative usages were recorded. Information not available in the two books was researched by the other two team members in online databases and in books from the University of Puerto Rico library. The team members who conducted the initial research then transferred this information to the table. While a description of the general use of each plant was being transcribed, the parts of the plant used were cataloged under the "Food", "Medicine", "Tools", "Clothing", and "Shelter" columns according to the usage, some plants had multiple usages. These usage columns were decided from previous material provided by the sponsor. The team members completed the first draft of the plant list in three full workdays, not including time spent on field expeditions.

3.1.3 Editing of the Table

The project team performed three primary edits of the plant list to ensure the accuracy of the information recorded with respect to the 165 plants identified during the two field expeditions. The next three sections provide details of the three edits.

3.1.3.1 First Edit

The next step was editing and revising the plant list. A team member, other than the initial two that worked on filling out the information, acted as editor, responsible for editing, verifying, and citing the information. The table was copied and pasted to Microsoft Excel from Microsoft Word due to the sponsor's preference and evolved into a table with 165 row entries, where each column is organized as shown in Table 6.

Table 6: Evolved Informational Table

Tree Common names, **Taíno name** *Scientific name*	Flowering	General use	Food	Medicine	Tools: crafts, small objects	Clothing/ Dye	Shelter construction, furniture	Taíno use/ Jibaro use	Picture	Reference

The editor read through the first volume of the *Common Trees of Puerto Rico and the Virgin Islands* to gather more specific details of the general uses for each plant. Additionally, this book was employed to verify the information in the table, match the plant name to the picture, to fill out common name or scientific name, and complete the citations in the "Reference" column. Pictures taken from the backup camera were added into the table where images of the plant, flower, or fruit were missing. In the case where more than one source was used for a plant species, a superscript number was added to the end of each piece of information to indicate the differences in sources.

The second volume of the *Common Trees of Puerto Rico and the Virgin Islands* was returned to the sponsor and was not available for the editor so the information from this source was not verified. All other information was verified or corrected with a credible source, such as Mr. Glogiewicz or authoritative books.

In some cases, the plant in the garden was of a different species but same genus as the plant listed in the book. These mistakes were corrected and noted with comments. Some species of plants had the same common name, and the description from the book *Common Trees of Puerto Rico and the Virgin Islands* was necessary to obtain the right information. For plants without any information in the "Flowering" and "General Use" column from the initial research, additional information and new citations were added to the table from the: *National Tropical Botanical Garden database; Purdue University Center for New Crops & Plant Products database; Google books database*; and other reputable databases accessed from Internet research.

Information on the Taínos' usages and names of specific plants was gathered from the book *Talking Taíno: essays on Caribbean natural history from a native perspective*; the document compiled from *Diccionario de voces indígenas de Puerto Rico,* provided by Mr. Glogiewicz called *Arboles Taínos – Guajata*; a booklet called *Los Arboles de la Arboleda Ancestral Taína,* published by CBCG and translated orally by Mr. Glogiewicz; and the document *Prehistory of Puerto Rico Osvaldo Garcia Goyco,* provided by Osvaldo Goyco. The usages of all relevant plants were documented in the "Taíno use" column with citations added in the "Reference" column. All words or citations that were not substantiated by the research materials provided, were identified and highlighted in yellow, or colored in red, depending on the words or citation that was not clear to the editor.

Two trips to the library of the Forestry Service at University of Puerto Rico, on March 23, 2010 and April 6, 2010, provided information on Taínos' usage of the indigenous plants and Taínos' plant names. The *Twenty-fifth annual report of the Bureau of American Ethnology: to the Secretary of the Smithsonian Institution* was researched for information about the Taínos and

their uses of the plants. The table was updated accordingly after each new book was studied. The book *Diccionario de voces indígenas de Puerto Rico* was used to identify Taíno plant names located in the garden. The "name of plant" column was formatted to show the common name in normal font, Taíno name in bold, and the scientific name in italics to allow for easier reading.

After an initial edit, the column titles were further refined: the "Tools" column was changed to "Tools: crafts, small objects" to include the usage of plant species in crafts and weaponry; the "Clothing" column adjusted to "Clothing/ Dye" so plants that made the fabric or the dyes for clothing were included; the "Shelter" column expanded into "Shelter construction, furniture" to include furniture making; and the "Taíno use" column improved into "Taíno use/ Jibaro use", containing Taíno uses in black and Jibaro use in maroon. Usages were moved to the appropriate column under the newly refined categorization. The second draft of the plant list was completed in six full workdays or 48 hours by one team member.

3.1.3.2 Second Edits

During this round of edits, each team member was in charge of a specific task so that each aspect of the table was inspected according to team members' expertise. One team member went through the table first for spelling and grammatical mistakes, while another team member who did not research the table, read through the Excel spreadsheet for any confusing points, lack of references, or formatting issues. Another team member who was in charge of creating the plant list examined the document for any concerns regarding the wording, spelling, and formatting of the table. This process was completed in two eight hour workdays rotating between three team members. A final round of editing was deemed necessary and the document was passed to the first editor for revision.

3.1.3.3 Third Edits

The first editor of the table performed the final revision for the plant list to correct all problems identified by the three editors during the second edits. The table below shows the final format of the table:

Table 7: Final Informational Table

List of plants and usages in Caguas Botanical and Cultural Garden

** Specific Taino usage in light green*

Common names **Taino name** *Scientific name*	Flowering Fruiting time	General use	Taino use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Flower Orchard										

The titles for some columns were redone to be inclusive of the information found in the cells and reformatted to be more legible. These changes can be seen in Table 7. All rows identifying a change in grove were highlighted in yellow to visually separate theses rows from the plant listings. The "Taíno use Jibaro use" column was moved next to the "General use" column to make the information flow more efficiently. Under the "Food", "Medicine", "Tools crafts small objects", "Clothing dye jewelry" and "Shelter construction furniture" columns, and information was colored in green if the usage was specifically Taínos. These columns were updated to new format to ensure consistency throughout the document.

During the review of the table, a few mismatches between the scientific names and the pictures were discovered. Due to the quality of the pictures and the team's limited knowledge in plant identification, it was possible that the matching was inaccurate for some listings in the table. As a result of identifying some of the discrepancy in the table, two trees, wax apple and bulletwood, were added to the table after a confirmation by the sponsor as to their location on the trail. This addition made the total amount of plants equal to 167. The calambreña tree and the bulletwood tree were missing picture entries after the re-identification process. A trip to the market at La Placita de Santurce was successful in obtaining additional pictures of the fruits of the algarrobo and níspero trees that were not available in the garden. Despite a possible disparity between the pictures and the plant names, the scientific names match up with the usage and flowering and fruiting information provided in the table.

During the first edit most confusion regarding plants with the same common name was resolved. However, three plants remained problematic. Three trees, the roble blanco, the jagüey, and the cotton tree, had the same common name for multiple species due to regional naming. The editor relied on information from *Lista Maestra Especies Arboles – Rev* to verify the correct

scientific name. This document contained a list of all existing plants in the garden which Jeffrey Glogiewicz used to identify the proper scientific name.

An additional document called *Taíno Agriculture* was provided by the sponsor that supplied Taíno names and places where the Taínos would have cultivated the plants. This document had limited impact because it only provided information on a few plant species. The information was added to the table with proper citations. The editor noted from this document that some plants contain botanical synonyms that made the research even more difficult. The editor verified with the USDA forest service website to ensure that the different scientific names correspond to the same plant. The information was then added to the list, after a difference in the taxonomy was confirmed. Plants with multiple scientific names only contain the most commonly used scientific names.

A total of 39 row entries were deleted due to a lack of an identifiable name, information, traceable or credible source, or repeats in entries. This process was necessary to ensure the quality of the table. A total of 128 plants remained in the table after the entries were evaluated based on reliable resources.

The editor made a second trip to the library of the US Forest Service to identify additional information regarding the Taínos. A conversation with Frank H. Wadsworth, the co-author of the two volumes of the *Common Trees of Puerto Rico and the Virgin Islands,* revealed that when Indians are mentioned in the book, this refers to the Taínos. This new information was important when the specific plants were selected for the development of the interpretive stories discussed in Section 3.3.

The final 128 entries in the plant list remained in the same order as they were recorded during the field expeditions. This order was chosen as the signage may not be available in

conjunction with the list. Each entry corresponds to the expected order that a visitor will see the plants following the FoRTS from start to finish. This draft is currently formatted to fit A2 paper. The garden can reformat it to better present this information to the visitors. An Excel file containing the plant list was provided to the sponsor for changes or updates. A pdf version of the Excel file is attached in a separate document labeled Appendix K.

3.2 Expert Interview

An interview with Dr. Osvaldo Garcia Goyco, the anthropologist from the Caguas Botanical and Cultural Garden, was conducted to complete the background research necessary for the development of the interpretive stories. This section outlines the process of preparing for the interview and the procedure of the interview itself.

3.2.1 Preparation

Before the interview was conducted, the team researched six Taíno legends from the following publications: *Twenty-fifth annual report of the Bureau of American Ethnology: to the Secretary of the Smithsonian Institution; Talking Taíno: essays on Caribbean natural history from a native perspective*; and *Taíno: Pre-Columbian Art and Culture from the Caribbean* to gain a better understanding of petroglyphs, legends, and Taíno lifestyle. These legends were read and documented in a Word document. This background was used to develop a list of questions for the onsite anthropologist, Dr. Osvaldo Garcia Goyco. The sponsor suggested that specific questions would be helpful during the interview, as the anthropologist possessed a wealth of knowledge and an eagerness to convey this information. The questions were designed to elicit the most concise answers possible. See sample interview questions in Appendix B.

3.2.2 Interview

The interview with Dr. Goyco, designed to obtain additional information about the Taíno legends, petroglyphs and lifestyle, was conducted on March 23, 2010 in the garden's boardroom.

This was an oral interview that began in the garden's boardroom that was relocated outside near the museum, to explain the meaning of the genuine petroglyph located on the garden's premise. Recently, the petroglyph was rescued from the black market and was sent to the CBCG for preservation and interpretation. Mr. Goyco was able to provide a professional interpretation of the petroglyph during the interview.

Figure 10: Petroglyph stone at the CBCG [Tsai, 2010]

The interview was conducted with the sponsor to ensure that it proceeded smoothly and without any concerns, such as language. The questions were divided among three team members with one team member remaining the primary note taker, while the team member with the fewest questions acted as a secondary note taker. The results of the interview are in Appendix B. Although the interview was quite lengthy and provided more information than necessary for the project, it helped verify parts of the existing research and supplied new information for the development of the interpretive stories.

3.3 Creation of Map

A team member created a map highlighting the FoRTS using the CBCG's original map. It accented the grove and plant locations. A team member used a digital image of the garden, seen in Figure 11, removing everything except for the trail as the previous maps had pixilated trail paths that were visually unappealing. Once the trail was edited out, the background was changed from white to the shade of green found in the original image.

Figure 11: Original map of the CBCG

Two landmarks were then added at the start and finish of the trail to help the visitor know which way to traverse the trail. These two landmarks were the museum and Batey court. To make the start and finish of the trail unmistakable, two black stars with the words "START" and

"FINISH" were added to their respective locations. Arrows were inserted into certain locations to lead the visitor along the trail. These locations were chosen to distinguish the direction at intersections with other trails that can be seen in Figure 11. Each sub-heading of the stories was then correctly labeled on the map for the visitors' reference.

During a final field expedition, approximate locations of plants were added to the map. A total of 52 plants, explained in section 3.4, each had a specific number corresponding to its location on the trail. For example, the first tree seen on the trail is labeled 1, the second 2 and so on until the last plant, numbered 52.

In addition to the numbered map, the original map of the garden seen in Figure 11 was included in the brochure. This helps the visitor see where they are in reference to other trails and clear up any confusion they have on which trail to take.

3.4 Interpretive Stories

A final set of 25 interpretive stories was designed to educate the visitors about the environment through the Taíno lifestyle. These stories were edited multiple times to ensure a cohesive, relevant and cogent product. The following sections briefly discuss the creation and editing of the interpretive stories.

3.4.1 First Draft

As the interpretive stories were the main deliverable of the project, the team went through the following process. The team first decision was to choose the voice of the stories, whether that would be first or second person. Mr. Glogiewicz's requested that the team use the voice of the Taínos. It was important to the sponsor that the stories inspire the visitors to believe in preservation and to conduct a greener life. It was determined that the voice that would be most

successfully accomplish this goal would be the second person. The interpretive stories were written using information from the plant list, the expert interview, and the compilation of legends.

The interpretive stories were designed to accommodate all visitors, with a primary focus on the eight to twelve year-old audiences. As there are three main age groups that visit the CBCG; eight to eleven-year-olds, twelve to eighteen-year-olds, and over eighteen-year-olds, the stories should be able to reach out to all age groups, while still being easy enough to be understood by the youngest visitor. The team utilized the sponsor's knowledge of these age groups as well as case studies to determine what information should be present in the interpretive stories.

The team designed the first draft of the interpretive stories using the guidelines from previous research on interpretive programs, choosing 60 plants based on their usages and familiarity to the visitors. The initial stories that were written depicted a Taínos family of four, mother, father, son, and daughter, through their daily lives. The sponsor decided the focus of the stories was not what he desired and requested a new draft following different guidelines.

3.4.2 Second Draft

A second draft of stories was then created by the team following the sponsor's guidance, including 52 plants. The list of plants was based on their importance to the Taínos, the number of uses, and the amount of information known about the plant. The team wrote the stories using second person for the voice of the stories. Once the list of plants and voice were decided, the team divided the plants up so each team member had approximately 13 plants. The plants were distributed to each member based on individual's research notes, preference, and ideas from the

previous draft. The stories followed interpretive story guidelines by not exceeding 200 words, being clear and concise and targeting eight to twelve year olds. When all stories were complete, each team member edited them individually. There were 44 stories (given in Appendix E) containing 52 plants. . A total of five stories contained more than one plant. Two stories contained three plants; these stories are the jabiyo, mabi, and abeyuelo and the yuca, lerén, and yautia. Three others contained two plants each; these are the hicaco and corázon; achiote and jaguar; and bulletwood and cupey. When no more edits were necessary the stories were completed, the team was able to add them into the guided brochure.

As the stories were not legible when they were placed into the brochure, the team, sponsor, and advisors decided it was best to reduce the number of stories to 25. The 25 stories kept out of the set of 44 were selected based on several factors; good portrayal of Taínos lifestyle, importance to the Taíno people, story line, size, and team members' preferences. For example, a story with an important Taínos event was chosen over one with only minor mentioning of Taínos relation to the plant. Additionally, if two stories included the same type of usage such as hut making, the better story was kept.

As a few stories about plants that were extremely important to the Taíno people were too long to be included on the brochure, they were shortened to fit into the brochure space. For example the team decided to remove all legends from the stories to save space. The sponsor and advisors read over the stories and made suggestions to improve the wording. Once the edits were incorporated into the stories, the final versions of the stories were placed into the layout of the guided brochure.

3.5 Guided Brochure

The design of the guided brochure, developed by two team members, was the final step toward combining all deliverables into one product. Three brochures; *A Guide to the Museum, Voice of the Land,* and *San Juan and the Forts of Old San Juan* were studied to determine the best layout. The team wanted to make the map as large as possible, without being so large that it couldn't be easily utilized, as noted from the *San Juan* brochure. For this reason, the map was designed to be the interior part of the brochure. Thus, when the map was opened, it was large enough to be legible, but not too large to obstruct the visitor's view of the plants on the trail.

3.5.1 Brochure Layout

The Voice of the Land brochure was easy to follow as it broke down the tour into sections according to landmarks. The text was all on one side and did not require any flipping of the brochure to read all the stories. The team wanted to follow this example and expert recommendations from background research. A double gatefold was chosen because it best fit the interpretive stories. There are six sections of text so a double gatefold would allow for a page for each section. The brochure was then folded in the center, to form front and back covers. Each separate view can be seen in Figures 12-15.

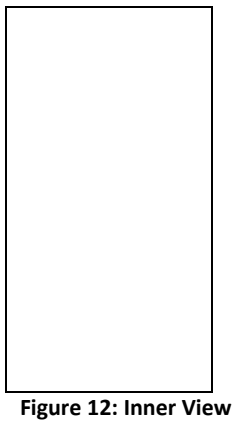


Figure 12: Inner View 1

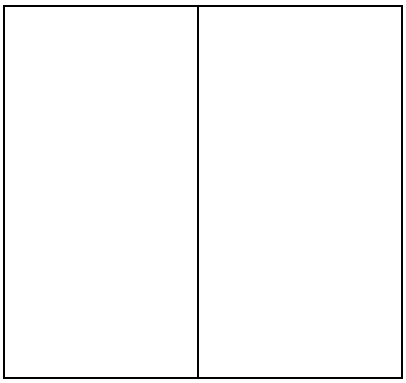


Figure 13: Front View

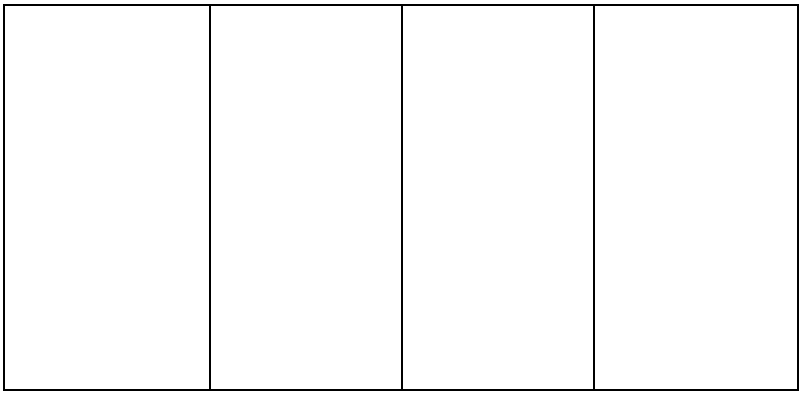


Figure 14: Inner View 2

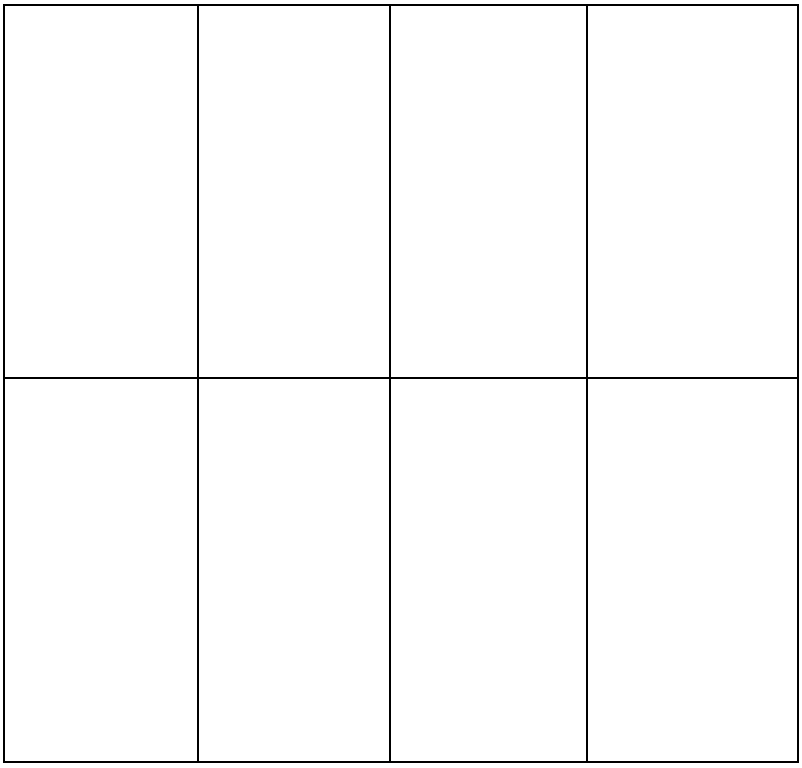


Figure 15: Inner View 3

3.5.2 Electronic Creation of Brochure

Mr. Glogiewicz approved the layout of the brochure before it was created electronically. Two team members used Microsoft Publisher to create an electronic version of the brochure. Microsoft Publisher was chosen because three of the four team members had access to the program. As Mr. Glogiewicz asked for the least expensive option for producing the brochure, the following factors were included in the layout. The size of the brochure was decided to be 11.693" x 16.535", a standard A3 format, as it is the largest size that can be printed on the equipment available at the garden without having to use outside contractors, which would have increased the initial cost of printing. Preliminary text boxes, with easy to follow labels, were added to the brochure to show where each section would be located. Background colors and initial information such as the title, site location, and the CBCG's information were then added on top of the text boxes. The color palette of the background and font was based on the colors used by the CBCG in their logo; this logo includes greens and browns. Each interpretive story was added to the corresponding section on the brochure. For example, stories about plants located in the fruit orchard were inserted in the fruit orchard section of the brochure. Times New Roman, size 8 font was the best size and font because it allowed for all the information to fit on the brochure while still making it legible. This was determined from research and the case studies of the *Botanical Garden* brochure and the *San Juan Cathedral and Christ Chapel* brochure. The UPR brochure used a serif font that was much easier to read than the San Juan brochure that used a sans serif font.

The verso of the brochure was created in the same document. Similar to the recto, text boxes were added to show the basic layout. The map of the FoRTS was added and fitted to the layout. The 52 plants in the original 44 stories were further refined by the sponsor. Plants in the

original stories are not necessarily the ones that appear in the final brochure. Each plant located on the trail was then added and numbered in the order that they appeared on the trail. Letters were only assigned to the final 25 plants written about in the interpretive stories. The plants were labeled numerically in correspondence to their position on the trail and alphabetically corresponding to their story. A team member then went back and labeled each interpretive story with the correct letter. The plant's names were written as follows:

#. **Common name (Taíno Name, if it exists)** **Letter Corresponding to Story**

Scientific Name

Symbols depicting uses

All of the main text is black, Times New Roman, size 11 font was used in order to fit the entire list of plants on the brochure, requiring several changes in font to fit the list onto the page.

Symbols, chosen to be easily recognizable to the reader, were added to signify the uses of each plant. One team member created all five symbols in Paint shop. These symbols were: a pineapple, a medical cross, an axe, an apron, and a house representing food, medicine, tools, clothing and shelter, respectively.

Figure 16: Key to brochure

The medical cross was taken from Microsoft Word's Clipart while the other four were taken from online sources. The websites where the symbols were found are the following:

- Pineapple - http://www.atomicpink.com/portfolio/illustrations/clipart/pineapple_color_thumb.gif
- Axe - http://dir.coolclips.com/History/British_History/Medieval_Times/Weapons/Stone_battle_axe_cart15
- Clothing - http://etc.usf.edu/clipart/license/license.htm
- Shelter - http://www.dreamstime.com/real-estate-clip-art-house-4-image226898

The symbols were inserted into the brochure and resized to a height of 0.209 inches with the width remaining untouched. Five vertical reference lines were added to each column, as well as a horizontal reference line after each plant name. The reference lines were used to get a linear and organized look. The vertical reference lines were spaced so each symbol would not touch but would remain within a fifth of an inch. Horizontal references were added an eighth of an inch from the bottom of the previous line. The symbols were centered on each vertical reference line, while the tops were equal with the horizontal lines. A key was then added in the upper left hand corner of the brochure to explain what each symbol and font style represented. A separate team member then edited the entire brochure making sure all information was correct and that no formatting errors were made.

3.5.2.1 Fold Lines

Fold lines were added to the brochure to ensure that the brochure is folded in the right order and place. A broadside fold line, labeled fold 1, was added cutting the brochure in half horizontally. The lines were numbered to ensure they were folded in the right order. Three right angle fold lines were then drawn in to complete the brochure. The outer left and right pages were labeled fold 2 and 3, respectively. These pages needed to be folded in towards the center first

because a second broadside fold would change the final layout of the brochure. The center fold line was labeled fold 4 and was the final fold line added.

3.4.3 Finalization of Brochure

The brochure was then printed in the CBCG's office on A3 paper. Since the printer does not print double-sided automatically, the verso of the brochure was printed first and was then fed back through to print the recto. Two team members then proofread the brochure for any mistakes. A final copy of the brochure was then printed using the same printer.

Once it was printed, all team members used the brochure to time how long it took to walk through the trail while reading the stories and map included in the brochure. Each team member was instructed to read the brochure slowly as if they were a visitor seeing all the plants and reading the stories for the first time. The individual times were recorded by three separate team members. A group time was recorded with two of the previous readers and a new reader to simulate a family. This was done to ensure more accurate results. The times were as follows

- Reader A: 53 minutes
- Reader B: 54 minutes
- Reader C: 1 hour 6 minutes
- Group A, consisting of reader B, C and D: 1 hour 4 minutes.

These times were averaged together, resulting in a time for the trail of approximately 1 hour. This result agrees with the sponsor's original request of a tour that lasted an hour and a half as it allows for a half hour visit to the museum before the tour begins.

Chapter 4 Results

This chapter discusses the three main components of the project results: the plant list, the set of interpretive stories, and the guided brochure. These three elements are envisioned as key pieces of a future interpretive program, designed to educate the visitors of the Caguas Botanical and Cultural Garden (CBCG). The plant list catalogs plants found along the FoRTS. Each of the 25 interpretive stories, the major creative piece of this project, focuses on a single plant from a refined list of plants on the FoRTS that were important to the Taíno people. The goal of the interpretive stories is to enable the CBCG's visitors to connect to Taíno history and the ecological environment present in Caguas. The guided brochure is intended to be carried by the visitors, and possibly by the tour guides, during their tour of the FoRTS. The brochure contains the interpretive stories, a map of the trail and a CBCG map, and symbols identifying the usages of plants indigenous to the area. These three deliverables for this project were designed from the information the team developed from background studies, field expeditions, general and archival research, expert interviews, and sponsor preferences.

4.1 Plant List with Usages

A plant list was first created to enhance the FoRTS, once reformatted and printed, this table could be used by visitors and tour guides alike. The plants are listed in the order seen by the visitors along the FoRTS beginning from the Start location. This spreadsheet will serve as a supplemental education tool for visitors of the CBCG who wish to increase their knowledge beyond the guided brochure. The table contains each plant species including common name, scientific name, and Taíno names if applicable. Along with the name, each plant has at least one picture in the table. If a visitor really wanted to become immersed in their experience at the

garden, they could obtain a copy of the plant list to find out information on all 128 plant species along the FoRTS.

This list could be made available on the CBCG's website in pdf format, or purchased, in booklet form, when visitors arrive at the garden. Currently the list is formatted on A2 paper and could be reformatted by the garden as necessary. This entire list can be found in Appendix K. The plant list was also designed to be used by a tour guide to supply them with additional information.

This list was a major source in the development of the interpretive stories. The directory of plants is presented as a Microsoft Excel spread sheet, containing 128 plant species. An example of this list can be seen in Table 8:

Table 8: Final Plant List

List of plants and usages in Caguas Botanical and Cultural Garden

				* *Specific Taino usage in light green*						
Common names **Taino name** *Scientific name*	Flowering Fruiting time	General use	Taino use Jibaro use	Food*	Medicine *	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Flower Orchard										
Ceiba *Ceiba pentandra*	Seed capsules mature in spring and summer[1]	Can be made into drums. Additionally, plants and other trees grow in the shade of this tree.[1]	Tainos used the tree for drums and canoes. [2]			Wood- ***drum, canoe***		Tree -*shade*		[1][Little & Wadsworth, 1964, p.332] [2][Keegan & Carlson, 2008, p.112; Glogiewicz, Personal communication, March 16, 2010]
Maga[3] *Montezuma speciosissima*	Flowering and fruiting throughout the year.[1]	Used for furniture, musical instruments, posts, and poles. [1]	The Tainos rubbed the wood together to make guatú (fire). [2]			Wood- *musical instruments, post,* ***fire maker***		Wood- *furniture, pole*		[1][Little & Wadsworth, 1964, p.328] [2][Glogiewicz, Personal communication, March 16, 2010]

The flowering and the fruiting section helps the visitor identify which plants would be in bloom during their visit. Additionally, the list contains the general uses of the plants separated out into modern usage, and Taíno/Jibaro usage. The usages of the plants are further simplified into categories that include: food, medicine, tools/crafts/small objects, clothes/dye/jewelry, and shelter/construction/furniture. These describe the parts of the plant employed and a short description of the usages. In addition, the list contains a picture to aid with the identification of each plant.

4.2 Interpretive Stories

A set of 25 interpretive stories, told from the perspective of a Taíno child, was written to be included in a guided brochure for the visitors. The goal of the stories is to educate the visitors of the CBCG on the Taíno lifestyle and their relationship with the ecosystem, while enhancing the visitor's curiosity to learn about living more harmoniously with nature. Each story focuses on one or more of the plants found on the FoRTS trail. The glossary included in the brochure can be seen below. All Taíno terms included in the stories are identified by italics. The sources referenced in the stories provided background information for the stories, which were the full creative effort of the team. The 25 stories are provided in their entirety below in the same order that the visitor on the trail would encounter the plants:

Glossary
Batey- a game involving a rubber ball and 20-30 people
Batos- rubber ball
Behique -priest
Cacique- chief
Cemi- God or object that represents the god
Cohoba- A snuff made from the smashed seeds of Cojóbana tree
Colisibi- a necklace made by interspersing small stones and seeds of the Corozo.
Conucos- fields where crops are planted
Guada- house garden
Naguas- apron worn by the married women
Nahos- paddles
Opia- spirits of the dead

A. ***Guava*** - You sit on a low branch of a guava tree and you bite into the sweet insides of its fruit. You enjoy the guava tree and are glad that it grows so close to home, in the *guada*. Your parents warn you about the spirits or *Opia* that feed from the Guava tree at night. The juice runs down your chin just as your father approaches the tree. He cries "*Opia*" as he pulls you from the branch. You giggle and point to your belly button to show him that you are not a spirit, but his daughter. [Keegan & Carlson, 2008, p.79, 112]

B. ***Cashew*** - You walk through the *conucos*, the ripe yellow and red Cashew apples catch your eye. You sit under the tree and eat the Cashew apples from the low branches and save the nuts for your mother. In a basket made from the leaves of the Maguey plant, you decide to bring back some fruits to the village. You can't wait to get home to roast the nuts with your mother. [Glogiewicz, Personal communication, April 14, 2010; Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.286; Fewkes, 1907, p.213]

C. ***Guanábana*** - Imagine you are a Taíno girl, you like the Guanábana tree that stands in the *guada*. When your mother gives the tree extra care, the fruit grows larger than your head! You are too scared to sit under this tree because the spiky fruit looks like the puffer fish that the fishermen bring to the *Behique* for his ceremonies. But as the fruit ripens, the spikes curl up and disappear, and you are not afraid to touch it.

Your mother opens up the fruit so the family can enjoy the tasty white insides. She tells you that the leaves are poisonous and to stay away from them, just like you stay away from the puffer fish. Sometimes you see your mother rub the leaves into your brother's scalp to kill off the itchy lice. You hope that your mother does not have to do the same for you! [Keegan & Carlson, 2008, p.79, 114; 4][Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.100]

D. ***Avocado*** - You watch the Avocado tree produce buttery fruit year after year. Your mother uses the creamy flesh just under the tough skin, and gets rid of the pit. You and your friends collect these pits. You grind the seeds on a rough rock, coloring your palms red. Do you like getting red dye all over your hands? You run to your mother and rub your hands on her *naguas.* You laugh as you see the new hand prints all over her beautiful *naguas*. [Krohn-Ching, 1980, p.75; Keegan & Carlson, 2008, p.78; Glogiewicz, Personal communication, March 16, 2010]

E. ***Caimito*** - You try to grab the Caimito fruit for your mother, but cannot reach the high fruit. You grab the branch and bend it closer, thinking that this branch would make a very good bow. You know that you should never cut the branches from the trees in the

guada. These trees produce fruit for the village. You decide to go further into the forest where your mother won't gather fruit. You then cut down a few branches from the tree for a new bow. [Keegan & Carlson, 2008, p. 79; Glogiewicz, Personal communication, March 16, 2010]

F. ***Mamey*** - You are glad the Mamey fruit is usually left for the *Opia* because it is one of the hardest fruits for you and your mom to prepare. The skin is thick and hard to cut. However, when you finally get to the fruit it is a juicy, bright orange color like a papaya. Can you taste it? [Glogiewicz, Personal communication, March 16, 2010; Glogiewicz, Personal communication, April 26, 2010]

G. ***Hicaco and Corázon*** - If you were a Taíno boy, what would you do in your free time? Would you enjoy going to the Hicaco tree? There you find lots of iguanas happily enjoying the fruit. You watch them run around, and sometimes even try to catch them. Your dad teaches you how to catch them as they run by. He makes a rope for you from the bark of the Corázon tree to tie the legs of the iguanas that you catch. Maybe one day you will be a hunter for your village! [Keegan & Carlson, 2008, p. 79; Glogiewicz, Personal communication, March 16, 2010]

H. ***Calambreña*** - The fruit of the Calambreña tree reminds you of your mother's jewelry. Today you decide to dress up. You pick a whole string of fruit from the tree and tie them loosely around your neck. You feel very beautiful dressed up like your mother. [Little & Wadsworth, 1964, p.85]

I. ***Roble Blanco*** - You go deep into the woods with your father to cut down a Roble Blanco tree. He teaches you how to create small boats from the trunk. Once you and your father finish the boat, the men of the village will use it for fishing trips. [Little & Wadsworth, 1964, p.498]

J. ***Algarrobo*** - You help your father strip a long piece of bark from the Algarrobo tree. Your father then bends the bark around wooden sticks to help form a canoe. This is one of your favorite ways of making canoes because it is made of just bark! [Benedetti, 2007]

K. ***Palma Real*** - The roof of your hut is old and leaky. You go to the Palma Real with some older boys to gather new palm branches to fix the leaks. Each time you go further into the forest so you don't hurt the palms by taking all their branches. Once you return, your dad cuts the leaves off of the branches to fix the roof. When he finishes, he uses the branches to make *macana*. [Fewkes, 1907, pp.44-45; Glogiewicz, Personal communication, March 16, 2010]

L. ***Higüero*** - Your favorite chore is to help your parents pick the gourds from the Higüero tree. The gourds grow in all sizes. Can you imagine what kind of things you can make from these gourds? Your father makes containers from these gourds by cutting them open and removing the seeds. You help him dry the gourds by placing them in the sun. [Glogiewicz, Personal communication, March 16, 2010; Arrom, 1998, p. 68; Fewkes, 1907, pp.73-74;]

M. ***Corozo*** - Today, you compete with your friends to see who collects the most seeds from the ground around the Corozo trees. You crawl under the smaller trees, because you know that the other girls are afraid of the spiny stems and leaves. You easily win the competition! You proudly walk home with a basket full of Corozo seeds so your mother can make a *colisibi*.[Glogiewicz, Personal communication, March 16, 2010]

N. ***Jabiyo*** - This is the first time you see the Jabiyo tree with ripe fruit! You reach toward the fruit with excitement. But suddenly, the fruit explodes! The sections of the fruit split off, and you see many flat brown seeds. You jump back in terror and grab hold of your mother's *naguas.* You learn to stay far away from this tree so you do not get hit by the seeds again! [Little & Wadsworth, 1964, p.276]

O. ***Jabiyo, Mabi, Abeyuelo*** - You watch as your mother smoothes the tough skin of the Jabiyo fruit into a moon shape for her necklace. You want to make a necklace like hers! You start by stringing the small seeds of Mabi and Abeyuelo together. Then, you bring the necklace to your mother who puts it around your neck. She is very proud of your first necklace. [Armstrong, 2008; Benedetti, 2007; Glogiewicz, Personal communication, March 16, 2010]

P. ***Ceiba*** - You gather with your tribe around the Ceiba tree. You are bored by the *Cacique*'s talk about the harvest. You wander around the adults, trying to find something fun to do, and the *Behique* gently pulls you down next to him. He tells you that every spike on the Ceiba tree is an ancestor. You look up at the tree in wonder, and try to find your

grandmother on the tree. Maybe she is that big spike at the very top! [Glogiewicz, Personal communication, April 7, 2010]

Q. ***Cojóbana*** - You see the *Cacique* offer crushed seeds of the Cojóbana tree to the *cemi*, before taking the *cohoba* to speak with the spirits. You hear from the student of the *Behique* that the *cohoba* helps you think. You wonder if his student is telling the truth. [Keegan & Carlson, 2008, pp. 89, 91; Glogiewicz, Personal communication, April 7, 2010]

R. ***Jagüey*** - Today you finally get to help your father hunt! You climb the same Jagüey tree where you caught your pet parrot, which is now on your shoulder. Your parrot calls other parrots to the area, you catch them with a little rope loop. You hand the parrots down to your father who brings them back to the village for their meat and feathers. You are very proud to be able to help your village! [US Forest Service, 1979 p.88; Fewkes, 1907, p.214]

S. ***Yuca, Lerén, Yautia*** - You travel to a new area of the forest to build a *conuco* for your mother. You help your father cut down all the plants that the tribe does not need and burn them. It is sad to see the fire, but your father tells you the land is not being hurt - the ashes will make the plants grow even bigger. [Keegan & Carlson, 2008, p.71-72]

After the fire is long gone, you return to the area with your mother to build mounds. You know that this is important, because last year the mounds saved the

vegetables from the floods. Your mother also likes the mounds because the Yuca, Lerén, and Yautia roots are much easier to dig up this way. [Keegan & Carlson, 2008, p.73]

Your mother uses the Yuca roots in many ways. The sweet Yuca is baked or boiled, while the bitter Yuca is used to make flour. You remember watching your mother do this when you were younger. First, she grinds the Yuca into a pulp and places it into a stretchy woven tube. Then she pinches the tube to squeeze out the bad juices. This pulp was then dried and made into the flour used for delicious cassava bread. [Keegan & Carlson, 2008, p. 74; Fewkes, 1907, pp. 52-53]

T. ***Achiote, Jagua*** - You like to play with the Achiote. The fruit has a prickly skin that makes you curious. Inside the seeds are very small and bright orange. Be careful! The seeds leave an orange stain on your skin. This reminds you of watching your father get ready for the Areytos. He paints his face and chest with black paint from the fruit of the Jagua tree. One day you will wear body paint and be part of the Areytos too![Figueroa, 1996; Keegan & Carlson, 2008, p. 79-80]

U. ***Tartágo emético*** - You decide to pick the red flowers of the Tartágo emético and wear them in your hair. When your father sees you, he laughs and pulls the flowers from your hair. He warns you never to touch these flowers again. He explains that the seeds are saved for special times to prepare the body for religious ceremonies. [Allsworth-Jones, 2008, p.60]

V. ***Chambibe*** - You go to the river, which has been prepared with a dam, to catch fish with your father. Your father picks out some Chambibe seeds from his pouch and hands them to you. On one of the rocks along the riverbank, you smash the seeds and throw them into the river. You watch as the fish float up, towards the dam, as if they are dead. Your father walks into the river toward the fish. You get the basket ready and catch the fish as your father throws them to you. You can almost taste the baked fish your mother will make tonight! [Benedetti, 2007]

W. ***Algodon*** - As a young Taíno girl, you cannot wait for the day that you get married and can wear a *naguas*. The Algodon trees that you and your mother visit will give you fluffy white cotton to make a *naguas*. You are secretly saving up cotton so that when you get married, you can make a *naguas* as long and as beautiful as your mother's. [Keegan & Carlson, 2008, p.68]

X. ***Bulletwood*** - You and your friends dropped the *batos* into the river. What will you tell the grownups? They are going to have a game of *Batey* this afternoon, but now they have no ball. The Cupey tree is too far away and you won't get back in time for the game. Your friends quickly go to the Bulletwood tree for some sap. You gather a few twigs and use the sap from your friends to make a perfect *batos* that looks even better than the one you lost in the river. Maybe the adults will never notice![Goyco, 2004, p.3; Glogiewicz, Personal communication, March 16, 2010]

Y. ***Maguey*** - Imagine yourself as a Taíno child. Where will you sleep? You sleep on a hammock made out of strings from the pounded Maguey leaves! You and your mother collect the strings, and weave them together to make hammocks for everyone in your family.[Fewkes, 1907, p.213]

4.3 Guided Brochure

A guided brochure was developed for use at the CBCG. It consists of a map of the FoRTS, the interpretive stories, a list of indigenous plants on the FoRTS relating to the interpretive stories, and the uses of these plants. The brochure was produced on A3 paper, using a serif font for the main text, and a non-serif font for the titles. The brochure incorporated a unique fold design that enabled ease of reading during the walking tour, as the map was compact enough to access the stories without requiring excessive flipping or folding. The guided brochure, shown panel by panel, can be seen in Figures 17-23. The full view of the guided brochure can be seen in Appendix L.

CAGUAS BOTANICAL AND CULTURAL GARDEN

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Caguas, Puerto Rico 00726

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Figure 17: Back Cover

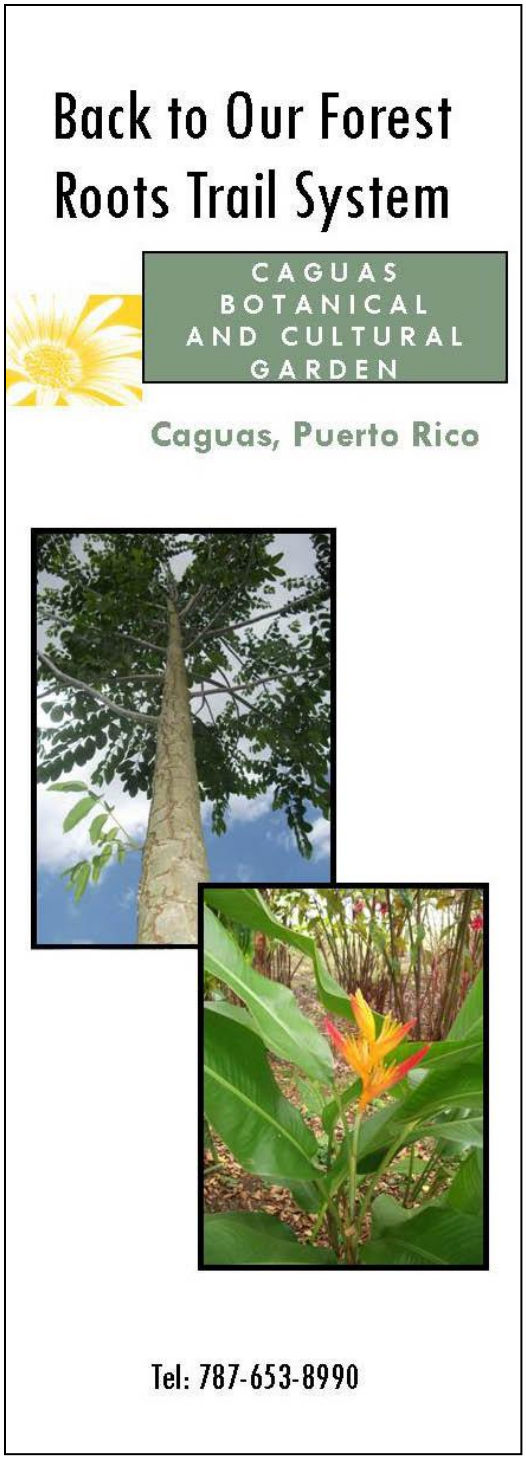


Figure 18: Final Brochure Front Cover

MURAL

The Taínos were a part of nature as much as nature was a part of them. This mural shows such a relationship. The Taínos believed that common roots between themselves and the natural world existed. The woman painted here is assembled from the mountains and the river, showing how she is connected to nature.

Bordering this mural are replicates of petroglyphs. Petroglyphs are stone carvings used by the Taínos to communicate with the spirits. The shaman heard messages from the rocks through the use of *cohoba*. The shaman would then convey these messages to artisans who would carve these images into the rocks. These carvings were usually done by the side of the river, so that the messages could be reflected into the water and seen by the dead. Petroglyphs can also be seen as decorations symbolizing different legends, lineages, and stories.

GLOSSARY OF TAINO WORDS USED IN INTERPRETIVE STORIES

Batos- rubber ball
Batey- a game involving a rubber ball and 20-30 people
Behique -priest
Cacique- chief
Cemi- God or object that represents the god
Cohoba- A snuff made of ground cojóbana seeds
Colisibi- a necklace made of small stones and corozo seeds
Conucos- fields where crops are planted
Guada- house garden
Naguas- apron worn by the married women
Opia- spirits of the dead

Figure 20: Inner View 1- Mural

PETROGLYPH INTERPRETATION

This petroglyph was rescued from an illegal sale and was taken to the Caguas Botanical and Cultural Garden for preservation and interpretation. This particular petroglyph is thousands of years old, showing the story of a specific *Caciques* lineage. The left side of the stone shows the mother's lineage. The women were always indicated on the left side. The female's side is displayed more in depth because, unlike many other cultures, the social ranking was passed down from the maternal line. In marriage the man moved to the woman's house to live with her family. However, he still retained his status as head of the household. The right side of the stone indicates the paternal lineage. The position of the *Cacique* was inherited by the sister of the *Cacique's* oldest child. The majority of the *Caciques* were male but they could also be female if there was no male heir.

As seen on this particular petroglyph, status was often indicated by symbols. Crowns specifically were seen to indicate status in society. Gender could also be determined by these symbols. Rays facing downward depict males, while legs indicate females. The upper part of the petroglyph shows a lineage from the famous four sons of Itiba Cahubaba. It is possible that this individual was part of the tortoise clan because the tortoise was born from the back of the oldest brother, Deminán Caracaracol.

Figure 19: Inner View 1- Petroglyph

FRUIT ORCHARD

A. Guava- You sit on a low branch of a guava tree and you bite into the sweet insides of its fruit. You enjoy the guava tree and are glad that it grows so close to home, in the *guada*. Your parents warn you about the spirits or *Opia* that feed from the Guava tree at night. The juice runs down your chin just as your father approaches the tree. He cries "*Opia*" as he pulls you from the branch. You giggle and point to your belly button to show him that you are not a spirit, but his daughter.

B. Cashew- You walk through the *conucos*, the ripe yellow and red Cashew apples catch your eye. You sit under the tree and eat the Cashew apples from the low branches and save the nuts for your mother. In a basket made from the leaves of the Maguey plant, you decide to bring back some fruits to the village. You can't wait to get home to roast the nuts with your mother.

C. Guanábana- Imagine you are a Taíno girl, you like the Guanábana tree that stands in the *guada*. When your mother gives the tree extra care, the fruit grows larger than your head! You are too scared to sit under this tree because the spiky fruit looks like the puffer fish that the fishermen bring to the *Behique* for his ceremonies. But as the fruit ripens, the spikes curl up and disappear, and you are not afraid to touch it.

Your mother opens up the fruit so the family can enjoy the tasty white insides. She tells you that the leaves are poisonous and to stay away from them, just like you stay away from the puffer fish. Sometimes you see your mother rub the leaves into your brother's scalp to kill off the itchy lice. You hope that your mother does not have to do the same for you!

D. Avocado- You watch the Avocado tree produce buttery fruit year after year. Your mother uses the creamy flesh just under the tough skin, and gets rid of the pit. You and your friends collect these pits. You grind the seeds on a rough rock, coloring your palms red. Do you like getting red dye all over your hands? You run to your mother and rub your hands on her *naguas*. You laugh as you see the new hand prints all over her beautiful *naguas*.

E. Caimito- You try to grab the Caimito fruit for your mother, but cannot reach the high fruit. You grab the branch and bend it closer, thinking that this branch would make a very good bow. You know that you should never cut the branches from the trees in the *guada*. These trees produce fruit for the village. You decide to go further into the forest where your mother won't gather fruit. You then cut down a few branches from the tree for a new bow.

F. Mamey- You are glad the Mamey fruit is usually left for the *Opia* because it is one of the hardest fruits for you and your mom to prepare. The skin is thick and hard to cut. However, when you finally get to the fruit it is a juicy, bright orange color like a papaya. Can you taste it?

G. Hicaco and Corázon- If you were a Taíno boy, what would you do in your free time? Would you enjoy going to the Hicaco tree? There you find lots of iguanas happily enjoying the fruit. You watch them run around, and sometimes even try to catch them. Your dad teaches you how to catch them as they run by. He makes a rope for you from the bark of the Corázon tree to tie the legs of the iguanas that you catch. Maybe one day you will be a hunter for your village!

H. Calambreña- The fruit of the Calambreña tree reminds you of your mother's jewelry. Today you decide to dress up. You pick a whole string of fruit from the tree and tie them loosely around your neck. You feel very beautiful dressed up like your mother.

MANAGED FOREST

I. Roble Blanco- You go deep into the woods with your father to cut down a Roble Blanco tree. He teaches you how to create small boats from the trunk. Once you and your father finish the boat, the men of the village will use it for fishing trips.

J. Algarrobo- You help your father strip a long piece of bark from the Algarrobo tree. Your father then bends the bark around wooden sticks to help form a canoe. This is one of your favorite ways of making canoes because it is made of just bark!

K. Palma Real- The roof of your hut is old and leaky. You go to the Palma Real with some older boys to gather new palm branches to fix the leaks. Each time you go further into the forest so you don't hurt the palms by taking all their branches. Once you return, your dad cuts the leaves off of the branches to fix the roof. When he finishes, he uses the branches to make *macana*.

L. Higüero- Your favorite chore is to help your parents pick the gourds from the Higüero tree. The gourds grow in all sizes. Can you imagine what kind of things you can make from these gourds? Your father makes containers from these gourds by cutting them open and removing the seeds. You help him dry the gourds by placing them in the sun .

M. Corozo– Today, you compete with your friends to see who collects the most seeds from the ground around the Corozo trees. You crawl under the smaller trees, because you know that the other girls are afraid of the spiny stems and leaves. You easily win the competition! You proudly walk home with a basket full of Corozo seeds so your mother can make a *colisibi*.

Figure 21: Inner View 2- first half

PRE-GARDEN

N. Jabiyo- This is the first time you see the Jabiyo tree with ripe fruit! You reach toward the fruit with excitement. But suddenly, the fruit explodes! The sections of the fruit split off, and you see many flat brown seeds. You jump back in terror and grab hold of your mother's *naguas*. You learn to stay far away from this tree so you do not get hit by the seeds again!

O. Jabiyo, Mabi, Abeyuelo- You watch as your mother smoothes the tough skin of the Jabiyo fruit into a moon shape for her necklace. You want to make a necklace like hers! You start by stringing the small seeds of Mabi and Abeyuelo together. Then, you bring the necklace to your mother who puts it around your neck. She is very proud of your first necklace.

P. Ceiba- You gather with your tribe around the Ceiba tree. You are bored by the *Cacique*'s talk about the harvest. You wander around the adults, trying to find something fun to do, and the *Behique* gently pulls you down next to him. He tells you that every spike on the Ceiba tree is an ancestor. You look up at the tree in wonder, and try to find your grandmother on the tree. Maybe she is that big spike at the very top!

Q. Cojóbana- You see the *Cacique* offer crushed seeds of the Cojóbana tree to the *cemi*, before taking the *cohoba* to speak with the spirits. You hear from the student of the *Behique* that the *cohoba* helps you think. You wonder if his student is telling the truth.

R. Jagüey- Today you finally get to help your father hunt! You climb the same Jagüey tree where you caught your pet parrot, which is now on your shoulder. Your parrot calls other parrots to the area, you catch them with a little rope loop. You hand the parrots down to your father who brings them back to the village for their meat and feathers. You are very proud to be able to help your village!

GARDEN

S. Yuca, Lerén, Yautia - You travel to a new area of the forest to build a *conuco* for your mother. You help your father cut down all the plants that the tribe does not need and burn them. It is sad to see the fire, but your father tells you the land is not being hurt - the ashes will make the plants grow even bigger.

After the fire is long gone, you return to the area with your mother to build mounds. You know that this is important, because last year the mounds saved the vegetables from the floods. Your mother also likes the mounds because the Yuca, Lerén, and Yautia roots are much easier to dig up this way.

Your mother uses the Yuca roots in many ways. The sweet Yuca is baked or boiled, while the bitter Yuca is used to make flour. You remember watching your mother do this when you were younger. First, she grinds the Yuca into a pulp and places it into a stretchy woven tube. Then she pinches the tube to squeeze out the bad juices. This pulp was then dried and made into the flour used for delicious cassava bread.

TAINO GROVE

T. Achiote, Jagua- You like to play with the Achiote. The fruit has a prickly skin that makes you curious. Inside the seeds are very small and bright orange. Be careful! The seeds leave an orange stain on your skin. This reminds you of watching your father get ready for the Areytos. He paints his face and chest with black paint from the fruit of the Jagua tree. One day you will wear body paint and be part of the Areytos too!

U. Tartago emético– You decide to pick the red flowers of the Tartágo emético and wear them in your hair. When your father sees you, he laughs and pulls the flowers from your hair. He warns you never to touch these flowers again. He explains that the seeds are saved for special times to prepare the body for religious ceremonies.

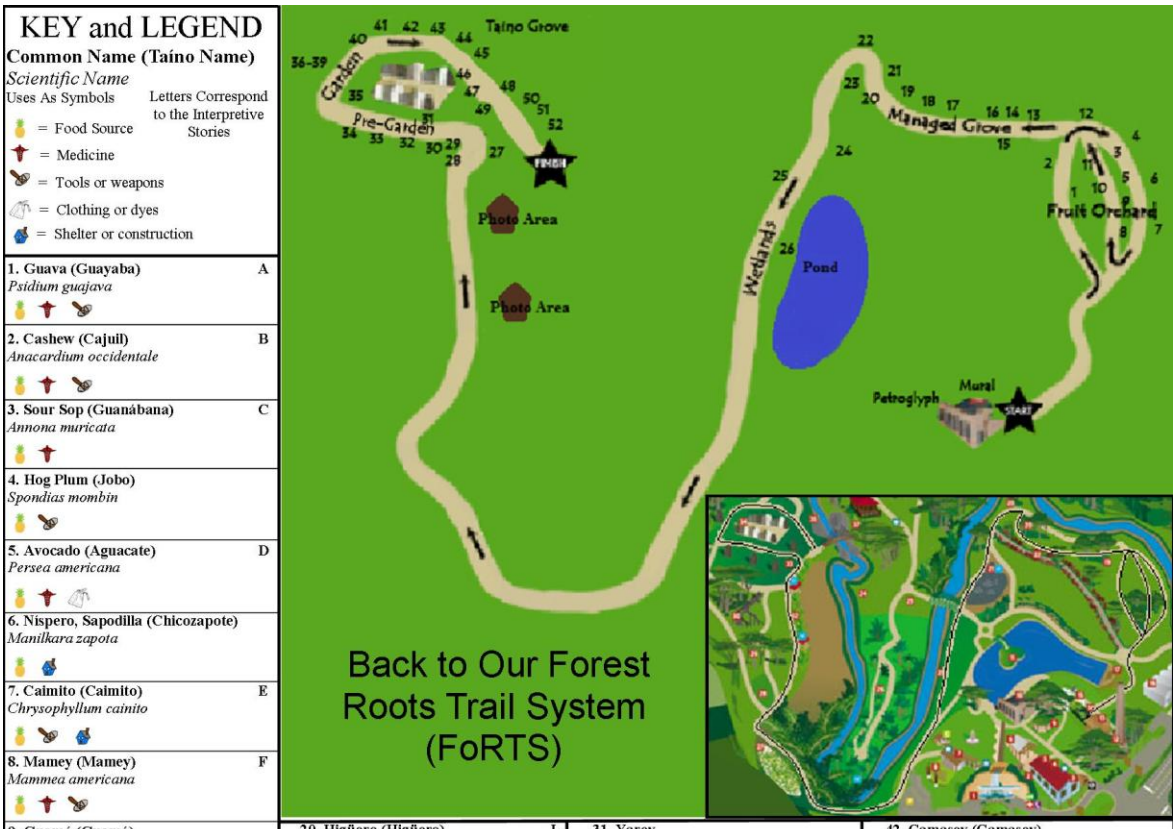
V. Chambibe- You go to the river, which has been prepared with a dam, to catch fish with your father. Your father picks out some Chambibe seeds from his pouch and hands them to you. On one of the rocks along the riverbank, you smash the seeds and throw them into the river. You watch as the fish float up, towards the dam, as if they are dead. Your father walks into the river toward the fish. You get the basket ready and catch the fish as your father throws them to you. You can almost taste the baked fish your mother will make tonight!

W. Algodon- As a young Taíno girl, you cannot wait for the day that you get married and can wear a *naguas*. The Algodon trees that you and your mother visit will give you fluffy white cotton to make a *naguas*. You are secretly saving up cotton so that when you get married, you can make a *naguas* as long and as beautiful as your mother's.

X. Bulletwood- You and your friends dropped the *batos* into the river. What will you tell the grownups? They are going to have a game of *Batey* this afternoon, but now they have no ball. The Cupey tree is too far away and you won't get back in time for the game. Your friends quickly go to the Bulletwood tree for some sap. You gather a few twigs and use the sap from your friends to make a perfect *batos* that looks even better than the one you lost in the river. Maybe the adults will never notice!

Y. Maguey– Imagine yourself as a Taíno child. Where will you sleep? You sleep on a hammock made out of strings from the pounded Maguey leaves! You and your mother collect the strings, and weave them together to make hammocks for everyone in your family.

Figure 22: Inner View 2- second half



1. Guava (Guayaba) A *Psidium guajava*	20. Higüero (Higüero) L *Crescentia cujete*	31. Yarey *Sabal causiarum*	42. Camasey (Camasey) *Miconia prasina*
2. Cashew (Cajuil) B *Anacardium occidentale*	21. Maria (Maria) *Calophyllum brasiliense*	32. Ceiba (Ceiba) P *Ceiba pentandra*	43. Uva de Playa (Guiabara) *Coccoloba uvifera*
3. Sour Sop (Guanábana) C *Annona muricata*	22. Maga (Maga) *Montezuma speciosissima*	33. Coaba *Amyris elemifera*	44. Tartigo Emetico (Tau tua) U *Jatropha multifida*
4. Hog Plum (Jobo) *Spondias mombin*	23. Corozo, Prickly Palm (Aovara) M *Acrocomia media*	34. Cojóbana (Cojóbana) Q *Piptadenia peregrina*	45. Guara (Guara) *Cupania americana*
5. Avocado (Aguacate) D *Persea americana*	24. Guácima (Guácima) *Guazuma ulmifolia*	35. Jagüey Blanco (Jagüey) R *Ficus laevigata*	46. Guayacán (Guayacán) *Guaiacum officinale*
6. Níspero, Sapodilla (Chicozapote) *Manilkara zapota*	25. Cupey (Cupey) *Clusia rosea*	36. Lerén (Lerén) S *Calathea allouia*	47. Chambibe V *Sapindus saponaria*
7. Caimito (Caimito) E *Chrysophyllum cainito*	26. Button Mangrove (Yana) *Conocarpus erectus*	37. Yautía (Yautía) S *Xanthosoma sagittifolium*	48. Almácigo (Carana) *Bursera simaruba*
8. Mamey (Mamey) F *Mammea americana*	27. Ortegón (Soco) *Coccoloba swartzii*	38. Manioc (Yuca) S *Manihot esculenta*	49. Cotton, Algodon (Sarobei) W *Gossypium hirsutum*
9. Guamá (Guamá) *Inga laurina*	28. Jabilla (Jabiyo) N & O *Hura crepitans*	39. Papaya (Papaya) *Carica papaya*	50. Bulletwood (Ausubo) X *Manilkara bidentata*
10. Hicaco (Hicaco) G *Chrysobalanus icaco*	29. Abeyuelo (Bitaran) O *Colubrina arborescens*	40. Jagua (Jagua) T *Genipa americana*	51. Pineapple (Ananá) *Ananas comosus*
11. Corázon (Mamón) G *Annona reticulata*	30. Mabi O *Colubrina elliptica*	41. Achiote (Bija) T *Bixa orellana*	52. Maguey (Maguey) Y *Agave americana*
12. Calambreña (Guarapo) H *Coccoloba venosa*			
13. Moca *Andira inermis*			
14. Guaraguao (Guaraguao) *Guarea trichilioides*			
15. Roble Blanco (Apamate) I *Didymopanax morototoni*			
16. Cedro Hembra (Caobana) *Cedrela odorata*			
17. Algarrobo (Guamá) J *Hymenaea courbaril*			
18. Palma Real (Yagua) K *Roystonea borinquena*			
19. Trumpet Tree (Yagrumo) *Cecropia peltata*			

Figure 23: Innermost View

The plants on the FoRTS map were numbered from 1-52, corresponding to the plant species listed on the inside of the brochure. Additionally, the map is labeled with the letters A through Y to correspond to the 25 stories that are also included in the brochure. The map also contains a smaller image of the entire garden map, so that the visitor can see where the trail lies within in the garden.

The FoRTS tour was timed to see how long it would take visitors to walk through, stopping at each plant in the brochure and reading the associated stories. On average, it was found to take approximately one hour (see Section 3.4.3).

4.4 Conclusion

This chapter presents the deliverables of this project including a plant list of 128 plants, 25 interpretive stories, and a guided brochure including the stories. These pieces may be used independent from each other or together by the visitors of the Caguas Botanical and Cultural Garden to increase their knowledge of the environment. It is the hope of this team that this project will provide the visitors of the CBCG with information on the Taíno lifestyle and their relationship with the ecosystem, while enhancing the visitor's curiosity to learn about living more harmoniously with nature through the use of our final deliverables.

Chapter 5 Conclusion and Recommendations

This project focused on the creation of a new trail system for the visitors of the Caguas Botanical and Cultural Garden (CBCG) called the Back to Our Forest Roots Trail System (FoRTS). A list of plant species along the FoRTS was created, including specie names and plant uses. The team created interpretive stories based on the Taíno lifestyle and culture using the information gathered from the plant list. The interpretive stories include indigenous plant species found on the FoRTS, to exhibit the Taínos' relationship with nature. In order to display these stories to the visitors, the team created a guided brochure including a map of the trail, interpretive stories, and the indigenous plant species with their uses.

After evaluating the history and context of the CBCG, the team acquired a basic understanding of the Taíno history and culture. Evidence of the Taínos interactions with their environment, specifically with local plant species was investigated. Furthermore, the team studied the theory behind environmental literacy and noticed that the natural setting of the CBCG is vital to the development of environmental literacy of the visitors. To complete the project, the team examined research studies that observed the learning styles of visitors to best design interpretive programming. From these studies, the team acquired a basic understanding of necessary guidelines to ensure visitors' full interest in the information.

An expert interview with the CBCG's anthropologist was conducted. Additionally, the team performed eight field expeditions through the garden to understand the location of important landmarks and plant species, to better create interpretive stories.

The team was excited about this opportunity to work with the Caguas Botanical and Cultural Garden. The team hopes the results of this proposed project will be able to help the CBCG to increase the environmental and cultural literacy of the visitors.

5.1 Recommendations

After completing the plant list, interpretive stories, and guided brochure the team decided upon several recommendations for the CBCG to examine. The CBCG or future project groups working at the garden can consider these recommendations.

5.1.1 Plant Identification

The team recommends that the CBCG create signs for each plant on the FoRTS stating the plant's common name, scientific name, and Taínos' name. These signs should be displayed below each plant in the garden, visible to the visitors. This recommendation is based upon the team's observations made while walking through the garden. Since visitors walking through the FoRTS will not have the necessary knowledge to identify the plants, signage will facilitate their understanding of the ecological trail they are traversing. The map located in the brochure, does not give an exact location of the plants. This should be done before the brochure is mass-produced so the visitor can be sure they are looking at the correct plant. Through these two forms of plant identification, the visitors will be able to increase their knowledge of the environment.

5.1.2 Interpretive Panels

Although a guided brochure will help to increase the visitors' understanding of how the Taínos lived with nature; there are still other opportunities to enhance the visitors' knowledge on this subject. The team recommends that the CBCG develop a set of interpretive panels to be incorporated along the FoRTS. These panels can be strategically placed in locations such as the fruit orchard, managed forest grove, wetlands, and Taíno grove. These panels can include stories developed in this project or new stories that include more information about the Taíno people. Previously researched information on interpretive panels can be seen in Appendix D.

5.1.3 Brochure Publication

The team believes that the production of this brochure for the gardens would provide a tool to educate visitors. Before this brochure is produced the team recommends that the garden first seek consent to publish the four previously copy-righted symbols, used to indicate usage in the inner most section of the brochure. The team would also recommend that the brochure be printed and re-typeset by a professional typesetter in a four-color separation on larger paper to increase the legibility of the text.

5.1.4 Interpretive Stories

The team has included the first draft of the original 44 interpretive stories of the 52 original plants on the FoRTS. This number was narrowed down because of space restrictions in the brochure. These stories can be found in Appendix E. These preliminary versions of 44 interpretive stories are provided to facilitate any adjustments to the FoRTS that might involve some of the plants in the Appendix. These adjustments could include season specific tours that would include only plants blooming or flowering during a specific season. It could also include a longer tour with more stories or legends.

5.1.5 Translated Website

While doing research on this project, the team made the observation that the CBCG website is only in Spanish. Having an English website similar to the current Spanish website is likely to increase the number of visitors to the garden, because the website will be accessible to more tourists. Although visitors can use an online translator tool to help render the website into their own language, most English speaking visitors will not search for the garden's website using the Spanish name. Therefore, without an English version of the website, typing in Caguas

Botanical and Cultural Garden into Google Search does not yield any results relating to the actual garden. In order to increase visitors from English speaking countries, we recommend that the CBCG create an English version of their current website.

5.1.6 More Tour Options

This project only examines the Taínos lifestyle and proposed a set of interpretive stories relating to the Taínos' relationship with nature. Parts of the garden such as the African indigenous grove have been omitted from this project. To increase the visitors' participation in every aspect the garden, future work can be done to create a tour focusing specifically on the African or Spanish groves.

REFERENCES

Allsworth-Jones, P. (2008). *Pre-Columbian Jamaica.* Tuscaloosa: University of Alabama Press.

Aquino, L. H. (1977). *Diccionario de voces indígenas de Puerto Rico* (2nd ed.). Río Piedras, Puerto Rico: Editorial Cultural.

Armstrong, W. P. (2008). *Botanical Jewelry Addendum.* Retrieved April 20, 2010, from http://waynesword.palomar.edu/ww0901c.htm

Arrom, J. (1998). The Creation Myths of the Taíno. In F. Bercht (Ed.), *Taíno: Pre-Columbian Art and Culture from the Caribbean* (pp. 68) Monacelli Press.

AtomicPink. *Pineapple Clipart.* Retrieved April 10, 2010, from http://www.atomicpink.com/portfolio/illustrations/clipart/pineapple_color_thumb.gif

Austin, D. F. C., & Honychurch, P. N. (2004). *Florida Ethnobotany*. London: CRC Press.

Australian National Botanic Gardens. (2008). *Callistemon (Bottlebrushes).* Retrieved April 3, 2010, from http://www.anbg.gov.au/callistemon/index.html

Bear, J. H. (2010a). *C Folds.* Retrieved April 14, 2010, from http://desktoppub.about.com/od/paper/g/cfolds.htm

Bear, J. H. (2010b). *Double Gatefold.* Retrieved April 14, 2010, from http://desktoppub.about.com/od/glossary/g/doublegatefold.htm

Benedetti, M. (2007). Los Arboles de la Arboleda Ancestral Taína. Libro Guía #1 de la Serie Etnobotánica. Jardín Botánico y Cultural. Caguas, Puerto Rico.

California Rare Fruit Growers, Inc. (1996). *ACEROLA Fruit Facts.* Retrieved March 31, 2010, from http://www.crfg.org/pubs/ff/acerola.html

California Rare Fruit Growers, Inc. (1996). *CARAMBOLA Fruit Facts.* Retrieved April 13, 2010, from http://www.crfg.org/pubs/ff/carambola.html

California Rare Fruit Growers, Inc. (1996). *Miracle Fruit Facts.* Retrieved March 31, 2010, from http://www.crfg.org/pubs/ff/miraclefruit.html

Cojóbana. Retrieved February 17, 2010 from http://web.me.com/jamarimutt/arbolesrum/cojobana.html

CoolClips.com. *Stone Battle Axe.* Retrieved April 10, 2010, from http://dir.coolclips.com/History/British_History/Medieval_Times/Weapons/Stone_battle_axe_cart1503.html

De Leon, S. (1974). *The Puerto Ricans in America*. Chicago, Illinois: Claretain Publications.

Dreamstime. *Real Estate Clip Art House 4.*http://www.dreamstime.com/real-estate-clip-art-house-4-image2258981

Driessnack, M. (2009). Children and Nature-Deficit Disorder. *Journal for Specialists in Pediatric Nursing, 14*(1), 73-75.

Duermyer, R.*Brochures - 5 Tips for a Great Brochure.* Retrieved April 14, 2010, from http://homebusiness.about.com/od/marketingadvertising/a/brochure_tips.htm

Duke, J. A. (1983). *Gossypium hirsutum L.* Unpublished manuscript. Retrieved April 3, 2010, from http://www.hort.purdue.edu/newcrop/duke_energy/gossypium_hirsutum.html

Duke, J. A. (1983). *Manihot esculenta Crantz.* Unpublished manuscript. Retrieved April 3, 2010, from http://www.hort.purdue.edu/newcrop/duke_energy/Manihot_esculenta.html

Duke, J. A. (1983). *Pennisetum purpureum K. Schumach.* Unpublished manuscript. Retrieved April 3, 2010, from http://www.hort.purdue.edu/newcrop/duke_energy/Pennisetum_purpureum.html

FCIT. *Apron.* Retrieved April 10, 2010, from http://etc.usf.edu/clipart/44400/44484/44484_apron_md.gif

Fewkes, J. W. (1907). *Twenty-fifth annual report of the Bureau of American Ethnology: to the Secretary of the Smithsonian Institution, 1903-04* U.S. Government Print Off

Figueroa, I. (1996, July 1996). Taínos of Puerto Rico, a cultural site. *El Boricua,* Retrieved February 3, 2010, from http://www.elboricua.com/history.html

Goyco, G. O. (2004). *History and Archaeology: Prehistory of Puerto Rico.* Retrieved March 29, 2010, from http://www.enciclopediapr.org/ing/article.cfm?ref=06102004

Guadalupe-Nipomo Dunes Draft Interpretive Master Plan. (2004). Retrieved February 13, 2010http://www.dunescollaborative.org/imp03.pdf

Jardín Botaníco Cultural de Caguas. (2007a). ***galeria_3.*** Retrieved April 17, 2010, from http://portalesp.caguas.gov.pr/jardin_botanico/galeria_3/index.html

Jardín Botaníco Cultural de Caguas. (2007b). *INFORMACIÓN GENERAL.* Retrieved April 19, 2010, from http://portalesp.caguas.gov.pr/jardin_botanico/informacion_general.html

Jardín Botaníco Cultural de Caguas. (2007c). *jardinbotanico.* Retrieved April 17, 2010, from http://portalesp.caguas.gov.pr/jardin_botanico/galeria_1_jardin/index.html

Jardín Botaníco Cultural de Caguas. (2007d). *Recorridos.* Retrieved April 17, 2010, from http://portalesp.caguas.gov.pr/jardin_botanico/recorridos.html

Jeanne, A., Donovan, M., & Thompson, H. A. (2005). *Recommendations for RBG Education Services*. Worcester, MA: Worcester Polytechnic Institute.

Keegan, W., & Carlson, L. A. (2008). *Talking Taíno: essays on Caribbean natural history from a native perspective*. Tuscaloosa: University of Alabama Press.

King, M., & Meadows, J. *Florida Food Fare.* Retrieved March 30, 2010, from http://sarasota.extension.ufl.edu/FCS/FlaFoodFare/Malanga.pdf

Krohn-Ching, V. (1980). *Hawaii dye plants and dye recipes*. Honolulu: University Press of Hawaii.

Liogier, A. H., & Martorell, L. F. (2000). *Flora of Puerto Rico and adjacent islands: a systematic synopsis* . San Juan, P.R.: Editorial de la Universidad de Puerto Rico.

Little, E. L., & Wadsworth, F. H. (1964). *Common trees of Puerto Rico and the Virgin Islands: Vol. 1* U.S. Dept. of Agriculture, Forest Service.

Little, E. L., Wadsworth, F. H., & Woodbury, R. O. (1974). *Common trees of Puerto Rico and the Virgin Islands: Vol. 2* U.S. Dept. of Agriculture, Forest Service.

Llamas, K. A. *Tropical flowering plants: a guide to identification and cultivation* Portland, OR; Timber Press, 2003.

Louv, R. (2005). *Last child in the woods: saving our children from nature-deficit disorder*. Chapel Hill, N.C.: Algonquin Books of Chapel Hill.

McDowell, M. A., Fryar, C. D., Ogden, C. L., & Flegal, K. M. (2008). Anthropometric

Reference Data for Children and Adults: United States, 2003-2006. *National Health Statistics Reports,* (Number 10).

Morton, J. F. (1987). *Fruits of warm climates*. Greensboro NC: Media, Incorporated.

Nair, I., Jones, S., Flavin, S., Deal, A. & Bajzek, D. (2003). *What is Environmental Literacy?* Retrieved January 28, 2010, from http://telstar.ote.cmu.edu/environ/m2/s1/envlit.shtml

National Tropical Botanical Garden. (2003). *Heliconia Psittacorum.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2004). *Aleurites moluccana.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2004). *Alpinia purpurata.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2004). *Averrhoa carambola.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2004). *Hedychium coronarium.* Retrieved April 3, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2004). *Heliconia wagneriana.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2005). *Bauhinia tomentosa.* Retrieved April 3, 2010, from http://ntbg.org/plants/plant_details.php

National Tropical Botanical Garden. (2005). *Pouteria campechiana.* Retrieved March 30, 2010, from http://ntbg.org/plants/plant_details.php

Ogden, S. (2007). *Garden bulbs for the South*. Portland, Or: Timber Press. Retrieved from Table of contents only http://www.loc.gov/catdir/toc/ecip0613/2006013496.html Publisher description http://www.loc.gov/catdir/enhancements/fy0702/2006013496-d.html

Orr, D. W. (1992). *Ecological literacy: education and the transition to a postmodern world*. Albany: State University of New York Press.

Palm & Cycad Societies of Florida, Inc. *Bactris gasipaes.* Retrieved March 31, 2010, from http://www.plantapalm.com/vpe/photos/Species/bactris_gasipaes.htm

Patil M. B., B. (2010). Antidiabetic activity of insulin plant (Costus igneus) leaf extract in diabetic rats. *Journal of Pharmacy Research, 3*(3) Retrieved from http://jpronline.info/article/view/1932/1129

Puerto Rico. (2010). In *Encyclopædia Britannica*. Retrieved April 15, 2010, from Encyclopædia Britannica Online: http://www.britannica.com/EBchecked/topic/482879/Puerto-Rico

Rodríguez, F. M., & Robineau-Germosén, L. (2009). *Cuban collaboration with the Program for Applied Research and Diffusion of Medicinal Plants in the Caribbean (TRAMIL).* Retrieved February 17, 2010, from http://scielo.sld.cu/scielo.php?pid=S1028-47962009000400009&script=sci_arttext

Scheper, J. (1999). *Allamanda cathartica.* Retrieved April 14, 2010, from http://www.floridata.com/ref/A/alla_cat.cfm

Scheper, J. (2003). *Veitchia merrillii.* Retrieved March 30, 2010, from http://www.floridata.com/ref/v/veit_mer.cfm

Scheper, J. (2004). *Ruellia brittoniana.* Retrieved April 3, 2010, from http://www.floridata.com/ref/R/ruellia.cfm

Scottish National Heritage. *Writing Interpretation* Scottish National Heritage.

Scottish National Heritage. *Producing Interpretive Panels* Scottish National Heritage. Retrieved from http://www.snh.org.uk/wwo/Interpretation/pdf/panels.pdf

Silk Cotton Tree. Retrieved February 17, 2010, from http://www.flmnh.ufl.edu/caribarch/Ceiba.htm

Smithsonian Institution. (2010). *Puerto Rican Bomba and Plena.* Retrieved April 15, 2010, from http://www.folkways.si.edu/explore_folkways/bomba_plena.aspx

Sung, C. K., Kimura, T., But, P. P. H., & Guo, J. (1998). *International Collation of Traditional and Folk Medicine: Northeast Asia* World Scientific Pub Co Inc.

Taylor, M., Barthuli, K. & Sharon, A. (2005). *Interpretation Along Route 66.* Retrieved April 14, 2010, from http://www.nps.gov/history/rt66/News/Charls_Pres.htm

The University of Queensland. (2006a). *Designing Brochures.* Retrieved April 14, 2010, from http://tourism.uq.edu.au/signage/brochure-design.html

The University of Queensland. (2006b). *Selecting Text & Illustrations.* Retrieved April 14, 2010, from http://tourism.uq.edu.au/signage/text-selection.html

Thomson, R., & Harper, M. (2000a). Ways to tell the Stories. *Telling the Stories: Planning Effective Interpretive Programs for Properties Listed in the National Register of Historic Places bulletin* National Park Service.

Thomson, R., & Harper, M. (2000b). What is Interpretation? *Telling the Stories: Planning Effective Interpretive Programs for Properties Listed in the National Register of Historic Places bulletin* National Park Service.

Tilden, F. (1977). *Interpreting our heritage* (3rd ed.). Chapel Hill, NC: University of North Carolina Press.

Trails to Build. *BC Trail Standards 4.7.* Retrieved April 14, 2010, from http://www.trailstobuild.com/Articles/BC%20Trail%20Standards/4-7.htm

Tropical Biology Association. *Cinnamomum verum.* Retrieved March 31, 2010, from http://www.tropical-biology.org/research/dip/species/Cinnamomum_verum.htm

Tsai, M. (2010). *Stone Petroglyph.*

USDA, & US Forest Service. Chapter 9 Interpretive Signs. Retrieved April 23, 2010, from http://www.fs.fed.us/outdoors/naturewatch/start/planning/Interp-Sign-Design.PDF

US Forest Service. (1979). *Manual para el técnico Forestal del Caribe*. Rio Piedras, Puerto Rico: Supervisor Forestal.

Wells, R., & Zeece, P. (2007). My Place in My World: Literature for Place-Based Environmental Education. *Early Childhood Education Journal, 35*(3), 285-291. Retrieved from http://dx.doi.org/10.1007/s10643-007-0181-8

Wenger, D. (2007). *Brochure Design Guidelines.* Unpublished manuscript.

Whistler, W. A. (2000). *Tropical ornamentals: a guide.* Portland, Or: Timber Press.

APPENDIX A: Cassava Bread

Manioc, or yuca in Taíno, was an important crop the Taínos cultivated. According to a Taínos' legend, Manioc was stolen by Deminan and his three brothers "from the high god Yaya" who brought it to the Taíno people [Keegan & Carlson, 2008, p.73]. This story symbolizes the importance of the yuca to the Taínos because they have to wrestle with higher power for the crop.

The Taínos cultivated two distinct types of maniocs. The sweet variety is perishable and can be boiled like a potato. The flour made from the bitter variety can be stored for month, but the process required is time consuming. The root can also be stored in the ground for up to 3 years before harvesting [p.74]. The Taínos were also known to ferment the tuber into a beer called Uicu for use during Areytos [p. 89].

The process of turning the bitter manioc into flour is important in Taínos culture because the tuber contains cyanide, which cannot be extracted just by boiling alone [p. 73-4]. The procedure starts by peeling the root and then grating it with a Guayo, or a grater board [Keegan & Carlson, 2008, p. 74; Fewkes, 1907, p. 52]. The Guayo can be either stingray skin as Gonzalo Fernández de Oviedo y Valdés (Oviedo) documented in 1525 [Keegan & Carlson, 2008, p. 23] or a board with sharpened stones held in place by vegetable gum [Keegan & Carlson, 2008, p. 74; Fewkes, 1907, p. 194]. The procedure then continues by stuffing the shredded root into a tube, similar to the Chinese finger trap, and squeezed to remove the poisonous juices. The remaining pulp is then dried and sifted into flour which is made into cassava bread. The Taínos used the poisonous juice to commit suicide when facing Spaniards oppression, however; the juice can be consumed after being boiled into a dish called cassareep (casiripe) [Keegan & Carlson, 2008, p. 74; Fewkes, 1907, pp. 52-53].

Cassava bread has other uses in the Taínos lifestyle other than for food. Iguanas were considered a delicacy and were kept in the village and fed cassava bread [Keegan & Carlson, 2008, p. 32]. Additionally, cassava bread was an essential part of the Areytos celebration. As described by Osvaldo Garcia Goyco, the anthropologist working in CBCG, the Cacique would offer the breads to the spirits before handing out a small piece of the breads to each household to be kept on the roof till the next year [Goyco, personal communication, March 23, 2010; Keegan & Carlson, 2008, p. 88]. Yuca was an incredibly important crop to the Taínos people as a source of food as well as a part of everyday life.

APPENDIX B: Minutes from Interview

Meeting Minutes from Interview with Osvaldo Garcia Goyco

3/23/2010
2:00 pm

Captain:
Megan Tsai
Secretary:
Abaigeal Caras
Attendance:
Abaigeal Caras
Tianna Melling
Benjamin Travis
Megan Tsai
Jeffrey Glogiewicz
Osvaldo Garcia Goyco

1) Medicine
    a) What plants were used for medicine?
    b) What kinds of ailments did these treat?
        i) *Osvaldo did not offer any information on this subject but recommended some publications on the subject.*
2) Food
    a) What type of food was eaten by the Taínos?
        i) Religious Ceremonies
            (1) Drank fermented drink made from yuca and mavi. The women made the yuca drink by chewing and spitting the yuca into a container in order to accelerate the fermentation process.
            (2) The Taínos, especially the Cacique, often fasted before and during ceremonies. Someone could be sustained on only water and a cocaine substance for months.
        ii) Game
            (1) The Taínos conducted ceremonies before they hunted, searching for permission to hunt. They would also never take more than what they needed.
    b) What plants were important to the Taínos cooking?
        i) *Acceptable plants*

(1) *The Taínos would only eat masculine plants. The masculine plants consisted of plants that were associated with the hunter or fisherman. They would never have eaten feminine plants.*

ii) *They often made jams from the local fruit.*

iii) *Cassava bread was incredibly important and was made from the yuca plant.*

3) Religion and Traditions

a) Does their religion resemble any other more familiar religions?

i) Have to look at mother societies to fully understand this society.

ii) Had very similar gods to the indigenous people of the Amazon.

(1) The names of the gods were related to sex, plants, growth, and agriculture.

(2) The Taínos saw most things in terms of male and female.

(a) The sun and the moon were considered male and female, respectively.

(b) Also saw this gender role in nature. Considered plants and trees either male or female, for example the male iguana and female lizard.

b) What kinds of things were associated with their religion?

i) *Believed that everything has life and is connected to the environment.*

ii) Myths often associated with nature and animals. Specifically the mockingbird, hummingbird, and tortoise were significant.

(1) These are represented in the major clans of the Taínos

(2) They were also portrayed in the chairs used during Areytos. They chairs were carved in the shape of animal that was associated with the clan.

c) How did they worship?

i) Cojóba was snorted during rituals and was believed to be a magic substance that released the soul. They believed that when taking this, they could communicate with their ancestors.

ii) Areytos or religious ceremonies

(1) Batey games were used to make important decisions.

(2) The Cacique and Behique would play the drums and maracas.

iii) There were rituals associated with the first yuca harvest.

(1) *Young women would come in with cassava on top of their heads and hand it out to the clan leaders. This was also offered to the gods. The bread was then brought*

back with the clan leader, so pieces of the cassava could be placed within the homes as a blessing.

4) Legends
    a) What kinds of legends were told?
        i) Stories were told of the dead and the afterlife.
        ii) Myths also showed lineages.
    b) What were some of the most popular legends?
        i) Opia was the place of the dead it was exactly the same as the normal world only days and nights were backwards
            (1) Guavaria was the ruler of this world.
            (2) Spirits would come from caves and take the form of humans at night and do the same things as they did in life. They would play ball and garden. They also enjoyed tricking the humans.
        ii) Guayhiona was responsible for establishing the clans. He named them and broke them up.
            (1) In one story he went to the island of guanine where he made love to a sea goddess but got sick with syphilis. The sea goddess was also the goddess of medicine so she cured him and gave him a necklace and earring. After this, he had to ask her permission to leave. After he got sick he changed his name to guanine (related with the sunset and the sunrise) He learned to be a shaman from her.
            (2) From then on the water spirit always taught the new shamans. She taught them to chant, to heal, and to communicate with the ancestors.
5) War and Hunting
    a) Did they possess weapons?
        i) They used gaseous grenades. They were made by placing poisonous plants into a gourd.
        ii) They used a club made from the palm tree called a macana.
        iii) The Taínos had spears. The spears had a wooden handle covered in cotton and a shell part that was used to balance the blade.
        iv) The Taínos used a bow and arrow.
    b) How did the Taínos hunt and fish?

i) Fishing

(1) They poisoned the fish with specific vines that were ground up and placed in the water. The fish could then be caught by hand.

(2) They used nets and traps made from wood.

(3) They would make fish hooks from turtle bones and shells.

(4) They used leeches while fishing by removing large leeches, which usually cling onto sharks, and attaching these to turtles.

ii) Hunting

(1) The Taínos trained dogs to hunt.

(2) They duck hunted using a floating gourd. The younger boys would sit in the water under the floating gourd and wait for ducks to land in the water. They would then grab them.

6) Petroglyphs

a) What kinds of things were petroglyphs used for?

i) *They were used to depict lineages and messages.*

(1) The spirits would speak through the rock and would tell what message they wanted to portray. Cojóba was used to aid this communication. This message was then communicated to an artisan who would create the petroglyph.

ii) *The petroglyph on site.*

(1) *This shows the linage of a specific Cacique.*

b) What are some of the most commonly seen symbols?

i) Symbols seen in the CBCG.

(1) Faces are often shown on petroglyphs.

(a) When shown with legs this depicted a female.

(b) Rays coming down from the face usually depicted a male.

(c) A crown shown on the head depicted high social ranking.

(2) The petroglyph was also divided in half. The maternal linage was shown on the left hand side while the paternal linage was shown on the right.

(3) The four sons of Itiba Cahubaba, who are twins, were depicted on the petroglyph perhaps showing a direct relationship to them or to the tortoise clan.

7) Caves

a) What were the caves used for by the Taínos?
    i) *They were used during hurricanes.*
    ii) *They were also used by the Behique during rituals*
    iii) *Would also carve symbols in the caves that corresponded with rituals.*
        (1) *There were two symbols representing the sun and the moon that were often carved into the walls of caves. Depending on whether the shaman sought rain or dryness, one of the symbols would be drawn in ropes.*
b) What were the caves that are in the Ethno-Ecological Trail System used for?
    i) *The team did not have time to ask this question.*

8) Everyday life
a) What were the men's roles each day?
    i) *The men hunted and fished.*
b) What were the women's roles each day?
    i) *The women gathered food.*
c) What did they do for fun?
    i) *Batey was played for fun but was also played in order to make important decisions.*
    ii) *Recited poetry.*
    iii) *Swam in the river.*
    iv) *Domesticated dogs and parrots.*
    v) *Played instruments.*
    vi) *They also simply sat by the fire, laughing and singing.*
d) What were the children's roles each day? Did the roles of the male children differ from that of the female children?
    i) *Their role was to help their mother, and to learn how to be good women and men.*
    ii) *There was not distinction between the genders until the passage ritual.*
e) What other notable traditions were associated with the Taínos people?
    i) *The Taínos people only worked half the day.*
    ii) *Cacique.*
        (1) *The food was first given to the Cacique before it was distributed to the people.*
        (2) *The Cacique could determine life or death.*
        (3) *One was not permitted to look the Cacique in the eyes.*

iii) Women were not permitted to touch the boats

iv) The men were not permitted to touch the cooking pots.

v) Marriage had to be between different clans.

(1) After marriage the man would move in with the bride's family.

APPENDIX C: Important Taínos Legends

Myth about the dead

Opia, or the spirits of the dead, lived on the island of Soraia in the land of Coaibai. In the daytime, the Opia inhabited Soraia. However, during the night, they returned to the world in human form [Fewkes, 1907, p.73]. The spirits liked the fruit bat that came out to feast on guava fruit. These spirits were similar to the Taínos in every aspect expect they had no naval [Keegan & Carlson, 2008, p. 112]. If someone met the Opia during the night, that person would disappear and be found attached to a tree [Fewkes, 1907, p.73].

Origin of the Ocean and Fish

An old man called Yaya, or supreme spirit, had a son named Yayael. Yayael tried to rebel against his father and was banished as a result. After four months of banishment, Yaya killed his son and placed the bones in a calabash, a gourd and hung it from the rafters of his house. One day, Yaya decided to see his son's bones. When he looked into the calabash, he found fish instead of bones. Yaya and his wife decided to eat these fish.

Then one day, the four sons of Itiba Cahubaba came to Yaya's house while he was out. The oldest of the four brothers, Deminán Caracaracol, was the only one who dared to take the calabash down. The four brothers decided to stuff themselves with the fish they found in the gourd. They then heard Yaya returning and panicked. In their haste they did not hang the calabash up securely. The calabash fell to the ground and broke. From it, water poured out, covering the land and forming the oceans. Fish from the calabash remained as inhabitant of the sea. [Arrom, 1998, p. 68; Fewkes, 1907, pp.73-74]

Fearing the wrath of Yaya, the four brothers fled to the land of their grandfather, Bayamanaco. Bayamanaco was making cassava bread when Deminán Caracaracol entered the house because he knew the secret of fire. Deminán Caracaracol asked for some bread from his grandfather, but the old man became enraged and spit cojóba onto Caracaracol's back. Caracaracol returned to his brother and complained of the pain on his back. With a stone instrument, the brothers cut open the swelling on Caracaracol's back and a female tortoise emerged. The four brothers then built a hut and lived with the tortoise [Arrom, 1998, p. 68; Fewkes, 1907, p.197].

Origin of the Sun and Moon

Islands formed from the water released from Yaya's broken gourd were inhabitable by humans. In order to sustain human life the Sun and the Moon came out of the cave called Iguanaboina (iguana-gray serpent) in the land of a cacique called Mautiatihuel [;]. The two Cemis in this cave are called Boinayel, god of rain, and Márohu, god of clear skies [Arrom, 1998, p. 73]

Alternate Origin of the Moon

A brother and his sister lived together. An unknown stranger would visit the sister after dark and lavish upon her. The sister decided to identify the stranger by blackening her hands with soot. She would touch the face of the visitor. When the sun rose, she found out that the stranger is her brother. The news spread as the sister condemned him with rage. Ashamed of his action, he fled the land and was changed into the moon. The dark spots on the moon are the soot left by the sister. When the sister gave birth to their son, he was named Hiaili after the hummingbird that will carry him to his father [Arrom, 1998, p. 76].

Origin of Humanity, Minerals, Plants, and Animals

In Hispaniola there was a mountain called Cauta that resided in the province of Caonao. The mountain had two caves called Cacibajagua and Amayaúna [Arrom, 1998, p. 72; Fewkes, 1907, p.74]. Taínos believed that their race came from the cave Cacibajagua. The second cave, Taínos believed, was where the rest of the people in the world came from [Arrom, 1998, p. 72; Keegan & Carlson, 2008, pp. 95-96]. The guardian of the Cacibajagua, Mácocael or Macoel, was a reptile often symbolized in Taínos petroglyphs as a lizard [Keegan & Carlson, 2008, p.34]. Mácocael was turned into stone one day by the sun because he was late to the cave. This stands for the realm of minerals [Arrom, 1998, p. 72; Keegan & Carlson, 2008, p.34; Fewkes, 1907, p.74]. The sun then catches several men who went fishing, and turned into jobo trees. This stands for the realm of plants [Arrom, 1998, p. 72; Fewkes, 1907, p.74]. Later the one called Guahayona told Yahubaba to gather some plants called digo. On his way to gather the digo the

sun caught Yahubaba and turned him into a bird similar to nightingale called Yahubabayael. This stands for the realm of flying and terrestrial animals [Arrom, 1998, p. 72].

Origin of Shaman/Cacique

Guahayona decided to leave Cacibajagua on a boat with all the women and some medicinal herbs. While leaving, the children cried for their mothers "Toa, toa" and were changed into little animals, like frogs [Arrom, 1998, p. 73; Goyco, 2004, p.5; Fewkes, 1907, p.74]. Along with the women and herbs Guahayona brought his brother-in-law, the cacique, Anacacuya, whom he eventually pushed overboard. At the island of Matininó, Guahayona left all the women and continued on his journey. Guahayona eventually arrived at Guanín Island and "made love to Gaubonito, goddess of the waters and the medicine."[Goyco, 2004, p.5] Guahayona contracted syphilis but was cured by the goddess. Before leaving, Gaubonito gave Guahayona a gold necklace and earrings called Guanines and cibas [Arrom, 1998, pp. 73, 76; Goyco, 2004, p.5].

Origin of Women

Since Guahayona left with all of the women, only Taíno men were left. One day while the men were bathing in the water, they saw some human shaped creatures sliding down the trees. These creatures were neither men nor women. The men tried catching them but did not succeed. The creatures were too slippery. The cacique summoned four Caracaracol to catch the creatures because Caracaracol had rough hands and would be able to catch the slippery beings. After catching the beings, the Taínos attached Inriris, or woodpeckers, to their waists in order to create female parts. The Inriri, thinking the creatures were wood, pecked and made holes where female sexual organs are usually located. This was how the women returned to the land [Arrom, 1998, p.78].

APPENDIX D: Background Information on Panels

Panels are an essential tool for ensuring the visitors gain as much information about the park as possible. Strategically placed panels can be very similar to having a tour guide. Important information is shown to the visitor in appropriate locations at the park. While on a self-guided tour, the panels will allow the visitor to move at their own pace and explore the information that interests them.

Since interpretive panels are so important to the visitors' experience, it is essential to know how to design them to make the signage user friendly. A good panel should follow the "3-30-3 rule" as explained in the Guadalupe-Nipomo Dunes Draft Interpretive Master Plan. The "3-30-3 rule" simply states that a visitor should gain increasing knowledge after reading the sign for 3 seconds, 30 seconds, and 3 minutes [*Guadalupe*, 2004, p. 41]. Interpretive panels should include visuals to tell a story about the place ["Producing", n.d., p. 1]. However, easy to read words on the panels are also essential. It is important to use short sentences, no more than twenty words, as well as short paragraphs [*Guadalupe*, 2004, p. 4]. Using short sentences and short paragraphs ensures that the visitor will not get lost and bored reading. In addition, each panel should try to keep the amount of words to less than 200 ["Producing", n.d., p.2]. A panel designed using these guidelines will insure that the visitor is not overwhelmed by the information presented.

The main text of the panel is usually the last thing a reader looks at. A typical reader will read the panel in the following way; the headline, the main picture, sub headings, bullet points, further illustrations, and then the main text ["Producing", n.d., p. 2]. It is important to make the panel captivating, so the visitor will stay and read the panel. Additionally, the headline and main picture should be able to tell the reader what the panel is about at a quick glance.

The ergonomics of the panel are also important to whether or not the visitor will stay and read the whole panel. If the panel is parallel with the ground it can cause strain on the visitors neck, over a period of time and will cause the visitor to stop reading and move on. A completely vertical sign will make it hard for the visitor to see anything behind the panel. Therefore it is recommended that the panel be positioned between 30 and 45 degrees [*Guadalupe*, 2004, p. 41]. It is important to know the heights of the potential visitors to gauge the height of the panel. In the United States the typical male height is 5 ft 9 ½ inches and a females typical height is 5 ft 4 inches [McDowell, Fryar, Ogden & Flegal, 2008, p. 13].

A goal of any park is to have repeat visitors. This is why it is important to have some panels be interchangeable to increase the visitors' desire to revisit the park. If all panels are permanent, regular visitors will have nothing new to look at and will not want to return. Having a mixture of permanent and temporary panels is one way to maintain visitors [*Guadalupe*, 2004, Pg. 42]. Interpretive panels are important to a visitor's experience, which is why much effort should go into making them as user-friendly and interesting as possible.

APPENDIX E: Draft of 44 Stories

Batey- a game involving a rubber ball and 20-30 people
Batos- rubber ball
Behique -priest
Cacique- chief
Cemi- God or object that represents the god
Cohoba- A snuff made from the smashed seeds of Cojóbana tree
Colisibi- a necklace made by interspersing small stones and seeds Corozo
Conucos- fields where crops are planted
Guada- house garden
Naguas- apron worn by the married women
Nahos- paddles
Opia- spirits of the dead

1. ***Guava*** - You sit on a low branch of a guava tree and you bite into the sweet insides of its fruit. You enjoy the guava tree and are glad that it grows so close to home, in the *guada*. Your parents warn you about the spirits or *Opia* that feed from the Guava tree at night. The juice runs down your chin just as your father approaches the tree. He cries "*Opia*" as he pulls you from the branch. You giggle and point to your belly button to show him that you are not a spirit, but his daughter. [Keegan & Carlson, 2008, p.79, 112]

2. ***Cashew*** - You walk through the *conucos*, the ripe yellow and red Cashew apples catch your eye. You sit under the tree and eat the Cashew apples from the low branches and save the nuts for your mother. In a basket made from the leaves of the Maguey plant, you decide to bring back some fruits to the village. You can't wait to get home to roast the nuts with your mother. [Glogiewicz, Personal communication, April 14, 2010; Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.286; Fewkes, 1907, p.213]

3. ***Guanábana*** - Imagine you are a Taíno girl, you like the Guanábana tree that stands in the *guada*. When your mother gives the tree extra care, the fruit grows larger than your head! You are too scared to sit under this tree because the spiky fruit looks like the puffer fish that the fishermen bring to the *Behique* for his ceremonies. But as the fruit ripens, the spikes curl up and disappear, and you are not afraid to touch it.

   Your mother opens up the fruit so the family can enjoy the tasty white insides. She tells you that the leaves are poisonous and to stay away from them, just like you stay away from the puffer fish. Sometimes you see your mother rub the leaves into your brother's scalp to kill off the itchy lice. You hope that your mother does not have to do the same for you! [Keegan & Carlson, 2008, p.79, 114; 4][Glogiewicz, Personal communication, March 16, 2010; Little & Wadsworth, 1964, p.100]

4. ***Jobo*** - You pick a golden fruit from the Jobo tree. You turn the fruit over in your hands. It reminds you of a story that your mother used to tell how the sun turned a group of fisherman into the Jobo tree. [Arrom, 1998, p. 72; Fewkes, 1907, p.74]

5. ***Avocado*** - You watch the Avocado tree produce buttery fruit year after year. Your mother uses the creamy flesh just under the tough skin, and gets rid of the pit. You and your friends collect these pits. You grind the seeds on a rough rock, coloring your palms red. Do you like getting red dye all over your hands? You run to your mother and rub your hands on her *naguas.* You laugh as you see the new hand prints all over her beautiful *naguas*. [Krohn-Ching, 1980, p.75; Keegan & Carlson, 2008, p.78; Glogiewicz, Personal communication, March 16, 2010]

6. ***Nispero*** - You lean against the trunk of the Nispero tree as you eat its small round fruits. You break the soft fruit open and taste the sweet flesh. As you lift your hand from the trunk you notice sap on your palms, the trunk is leaking a gummy sap. [Little & Wadsworth, 1964, p.446;Glogiewicz, Personal communication, March 16, 2010]

7. ***Caimito*** - You try to grab the Caimito fruit for your mother, but cannot reach the high fruit. You grab the branch and bend it closer, thinking that this branch would make a very good bow. You know that you should never cut the branches from the trees in the *guada***.** These trees produce fruit for the village. You decide to go further into the forest where your mother won't gather fruit. You then cut down a few branches from the tree for a new bow. [Keegan & Carlson, 2008, p. 79; Glogiewicz, Personal communication, March 16, 2010]

8. ***Mamey*** - You are glad the Mamey fruit is usually left for the *Opia* because it is one of the hardest fruits for you and your mom to prepare. The skin is thick and hard to cut. However, when you finally get to the fruit it is a juicy, bright orange color like a papaya. Can you taste it? [Glogiewicz, Personal communication, March 16, 2010; Glogiewicz, Personal communication, April 26, 2010]

9. ***Bay-Rum*** - You return to the village after a long afternoon of swimming in the river. You walk beside your sister as you approach the village. You start running as fast as you can because you smell the most amazing aroma! It is the smell of the Bay Rum tree! You love when your mother cooks with its oil.[Little & Wadsworth, 1964, p.414]

10. ***Hicaco, Corázon*** - If you were a Taíno boy, what would you do in your free time? Would you enjoy going to the Hicaco tree? There you find lots of iguanas happily enjoying the fruit. You watch them run around, and sometimes even try to catch them. Your dad teaches you how to catch them as they run by. He makes a rope for you from the bark of the Corázon tree to tie the legs of the iguanas that you catch. Maybe one day you will be a hunter for your village! [Keegan & Carlson, 2008, p. 79; Glogiewicz, Personal communication, March 16, 2010]

11. ***Calambreña*** - The fruit of the Calambreña tree reminds you of your mother's jewelry. Today you decide to dress up. You pick a whole string of fruit from the tree and tie them loosely around your neck. You feel very beautiful dressed up like your mother. [Little & Wadsworth, 1964, p.85]

12. ***Moca*** - You travel with your father to the Moca tree. You watch carefully as he takes the leaves and flowers from the tree. He places them into two bundles. He hands you the smaller bundle and you help him carry the bundle back to the village. When you return, you watch your father make rope from the fibers of the leaves and flowers. You use this rope to make repairs on your home. [Benedetti, 2007]

13. ***Guaraguao*** - You travel into the woods with your father and two other men from the tribe. The tribe needs a new house and you will help collect some wood. You travel half a day from the village before you find the perfect tree, the Guaraguao tree. Your father tells you that it is perfect for the new house. [Little & Wadsworth, 1964, p.244]

14. ***Roble Blanco*** - You go deep into the woods with your father to cut down a Roble Blanco tree. He teaches you how to create small boats from the trunk. Once you and your father finish the boat, the men of the village will use it for fishing trips. [Little & Wadsworth, 1964, p.498]

15. ***Cedro*** - You and your father locate the perfect Cedro tree! You help your father to cut down the tree, careful not to harm any other trees in the process. Watch out below! [Benedetti, 2007]

16. ***Algarrobo*** - You help your father strip a long piece of bark from the Algarrobo tree. Your father then bends the bark around wooden sticks to help form a canoe. This is one of your favorite ways of making canoes because it is made of just bark! [Benedetti, 2007]

17. ***Palma Real*** - The roof of your hut is old and leaky. You go to the Palma Real with some older boys to gather new palm branches to fix the leaks. Each time you go further into the forest so you don't hurt the palms by taking all their branches. Once you return, your dad cuts the leaves off of the branches to fix the roof. When he finishes, he uses the branches to make *macana*. [Fewkes, 1907, pp.44-45; Glogiewicz, Personal communication, March 16, 2010]

18. ***Trumpet tree*** – Your father is away on a fishing trip but your hut is leaky and must be fixed. You decide to use the Trumpet tree's wood to repair the area. You are proud to help your family all by yourself! [Little & Wadsworth, 1964, p.66]

19. ***María*** - You are startled when the Behique comes into your home with a big bowl. He has heard that you are sick and is bringing you medicine from the sap of the María tree. You force the weird medicine down, and within a few days you feel all better! [Little & Wadsworth, 1964, p.348; Glogiewicz, Personal communication, March 16, 2010]

20. ***Higüero*** - Your favorite chore is to help your parents pick the gourds from the Higüero tree. The gourds grow in all sizes. Can you imagine what kind of things you can make from these gourds? Your father makes containers from these gourds by cutting them open and removing the seeds. You help him dry the gourds by placing them in the sun. [Glogiewicz, Personal communication, March 16, 2010; Arrom, 1998, p. 68; Fewkes, 1907, pp.73-74;]

21. ***Maga*** - You father returns to the village with wood from the Maga tree. Your mother uses this wood to make her cooking fires. Today you are helping her make the cassava bread. You know how important cassava bread is to the people of your village! [Glogiewicz, Personal communication, March 16, 2010; Goyco, Personal communication, March 23, 2010]

22. ***Corozo*** - Today, you compete with your friends to see who collects the most seeds from the ground around the Corozo trees. You crawl under the smaller trees, because you know that the other girls are afraid of the spiny stems and leaves. You easily win the competition! You proudly walk home with a basket full of Corozo seeds so your mother can make a *colisibi*.[Glogiewicz, Personal communication, March 16, 2010]

23. ***Jabiyo*** - This is the first time you see the Jabiyo tree with ripe fruit! You reach toward the fruit with excitement. But suddenly, the fruit explodes! The sections of the fruit split off, and

you see many flat brown seeds. You jump back in terror and grab hold of your mother's *naguas.* You learn to stay far away from this tree so you do not get hit by the seeds again! [Little & Wadsworth, 1964, p.276]

24. ***Guácima*** - Your house is old and beginning to rot. You go into the forest with your father and look for the Guácima tree. This tree will be cut down and used to build a new side for your hut. [Glogiewicz, Personal communication, April 14, 2010]

25. ***Emajagüilla*** - You stand in front of the Emajagüilla tree. You look up at the tree and try to imagine yourself burning the roots of the tree and cutting it down to make a canoe like you have seen your father do. You know the tree is not yet large enough to use as a boat, but wonder if by the time you are grown it will be ready! [Little & Wadsworth, 1964, p.330; Fewkes, 1907, p.208]

26. ***Jabiyo, Mabi, Abeyuelo*** - You watch as your mother smoothes the tough skin of the Jabiyo fruit into a moon shape for her necklace. You want to make a necklace like hers! You start by stringing the small seeds of Mabi and Abeyuelo together. Then, you bring the necklace to your mother who puts it around your neck. She is very proud of your first necklace. [Armstrong, 2008; Benedetti, 2007; Glogiewicz, Personal communication, March 16, 2010]

27. ***Yarey*** - You stand next to a Yarey tree, you reach up and easily cut off a large group palms leaves. You bring them to your parents and help put the leaves on the roof for extra protection against rain. You feel strong because you can lift the palm leaves up to the roof all by yourself![Fewkes, 1907, p.44]

28. ***Ceiba, Coaba*** - You gather with your tribe around the Ceiba tree during the night. You are bored by the *Cacique*'s talk about the harvest. You wander around the adults, trying to find something fun to do, and the *Behique* gently pulls you down next to him. He tells you that every spike on the Ceiba tree is an ancestor. You look up at the tree, lit by a torch made from a branch from the Coaba tree, and try to find your grandmother on the tree. Maybe she is that big spike at the very top! [Glogiewicz, Personal communication, April 7, 2010]

29. ***Cojóbana*** - You see the *Cacique* offer crushed seeds of the Cojóbana tree to the *cemi*, before taking the *cohoba* to speak with the spirits. You hear from the student of the *Behique* that the *cohoba* helps you think. You wonder if his student is telling the truth. [Keegan & Carlson, 2008, pp. 89, 91; Glogiewicz, Personal communication, April 7, 2010]

30. ***Jagüey*** - Today you finally get to help your father hunt! You climb the same Jagüey tree where you caught your pet parrot, which is now on your shoulder. Your parrot calls other parrots to the area, you catch them with a little rope loop. You hand the parrots down to your father who brings them back to the village for their meat and feathers. You are very proud to be able to help your village! [US Forest Service, 1979 p.88; Fewkes, 1907, p.214]

31. ***Yuca, Lerén, Yautia*** - You travel to a new area of the forest to build a *conuco* for your mother. You help your father cut down all the plants that the tribe does not need and burn them. It is sad to see the fire, but your father tells you the land is not being hurt - the ashes will make the plants grow even bigger. [Keegan & Carlson, 2008, p.71-72]

After the fire is long gone, you return to the area with your mother to build mounds. You know that this is important, because last year the mounds saved the vegetables from the floods. Your mother also likes the mounds because the Yuca, Lerén, and Yautia roots are much easier to dig up this way. [Keegan & Carlson, 2008, p.73]

Your mother uses the Yuca roots in many different ways. The sweet Yuca is baked or boiled, while the bitter Yuca is used to make flour. You remember watching your mother do this when you were younger. First, she grinds the Yuca into a pulp and places it into a stretchy woven tube. Then she pinches the tube to squeeze out the bad juices. This pulp was then dried and made into the flour used for delicious cassava bread. [Keegan & Carlson, 2008, p. 74; Fewkes, 1907, pp. 52-53]

32. ***Papaya*** - You complain of a sore throat! Your mother goes to the papaya tree and makes you a soothing tea using the leaves of the tree. When you finish the drink, your throat feels so much better! [Little & Wadsworth, 1964, p.374; Glogiewicz, Personal communication, March 16, 2010]

33. ***Pineapple*** - You bite into the sweet yellow flesh of a newly picked pineapple. It tastes so good! You eat this delicious fruit quickly because all of the other children want a piece too!

34. ***Achiote, Jagua***- You like to play with the Achiote. The fruit has a prickly skin that makes you curious. Inside the seeds are very small and bright orange. Be careful! The seeds leave an orange stain on your skin. This reminds you of watching your father get ready for the Areytos. He paints his face and chest with black paint from the fruit of the Jagua tree. One

day you will wear body paint and be part of the Areytos as well![Figueroa, 1996; Keegan & Carlson, 2008, p. 79-80]

35. ***Camasey*** – Your little brother is sick. You go to the Camasey tree and pick some fruit. You bring the fruit back to your mother. She takes the fruit and makes medicine to give to your brother. Your brother feels much better and promises to help you the next time you are sick! [Benedetti, 2007]

36. ***Guiabara*** -. You gather the fruit from the Guiabara. As you walk back into the village with your fruit you are asked to give it to the Behique. Several of the villagers are sick with malaria! The fruit is made into a drink and given to the sick villagers to make them feel better. [Benedetti, 2007]

37. ***Tartágo emético*** - You decide to pick the red flowers of the Tartágo emético and wear them in your hair. When your father sees you, he laughs and pulls the flowers from your hair. He warns you never to touch these flowers again. He explains that the seeds are saved for special times to prepare the body for religious ceremonies. [Allsworth-Jones, 2008, p.60]

38. ***Guara*** - You climb the Guara tree with your friends. Suddenly, you slip and fall, landing on your hand! You cry out! Your hand hurts and is already swollen. Your friends grab leaves from the Guara tree and help you back to the village. Your mother makes the leaves in to a soup to help heal your hurt hand! [Benedetti, 2007]

39. ***Guayacán*** - You take some extra wood from the Guayacán tree and carve a small statue of a hill, a mini-cemi. This makes you feel as if you are part of the hill! [Benedetti, 2007]

40. ***Almácigo*** – It is night and very dark outside. You forgot to pick up your toys outside and your parents are making you and your brothers do it now. You are scared because you parents have warned you of the *Opia* that come out at night! Your brother takes an Almácigo branch from the tree next to your house. He uses the branch as a torch. You feel much safer with this light! [Benedetti, 2007]

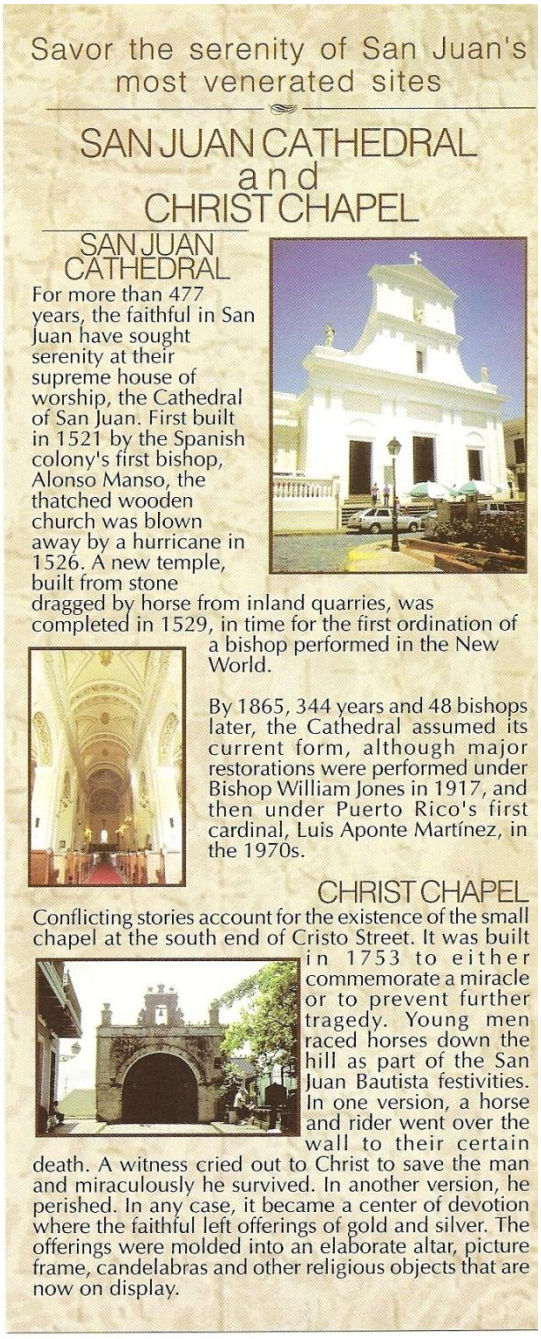
41. ***Chambibe*** - You go to the river, which has been prepared with a dam, to catch fish with your father. Your father picks out some Chambibe seeds from his pouch and hands them to you. On one of the rocks along the riverbank, you smash the seeds and throw them into the river. You watch as the fish float up, towards the dam, as if they are dead. Your father walks into the river toward the fish. You get the basket ready and catch the fish as your father throws them to you. You can almost taste the baked fish your mother will make tonight! [Benedetti, 2007]

42. ***Algodon*** - As a young Taíno girl, you cannot wait for the day that you get married and can wear a *naguas*. The Algodon trees that you and your mother visit will give you fluffy white cotton to make a *naguas*. You are secretly saving up cotton so that when you get married, you can make a *naguas* as long and as beautiful as your mother's. [Keegan & Carlson, 2008, p.68]

43. ***Bulletwood, Cupey*** - You and your friends dropped the *batos* into the river. What will you tell the grownups? They are going to have a game of *Batey* this afternoon, but now they have no ball. The Cupey tree is too far away and you won't get back in time for the game. Your friends quickly go to the Bulletwood tree for some sap. You gather a few twigs and use the sap from your friends to make a perfect *batos* that looks even better than the one you lost in the river. Maybe the adults will never notice![Goyco, 2004, p.3; Glogiewicz, Personal communication, March 16, 2010]

44. ***Maguey*** - Imagine yourself as a Taíno child. Where will you sleep? You sleep on a hammock made out of strings from the pounded Maguey leaves! You and your mother collect the strings, and weave them together to make hammocks for everyone in your family.[Fewkes, 1907, p.213]

APPENDIX F: San Juan Cathedral and Christ Chapel Brochure



Savor the serenity of San Juan's most venerated sites

SAN JUAN CATHEDRAL and CHRIST CHAPEL

SAN JUAN CATHEDRAL

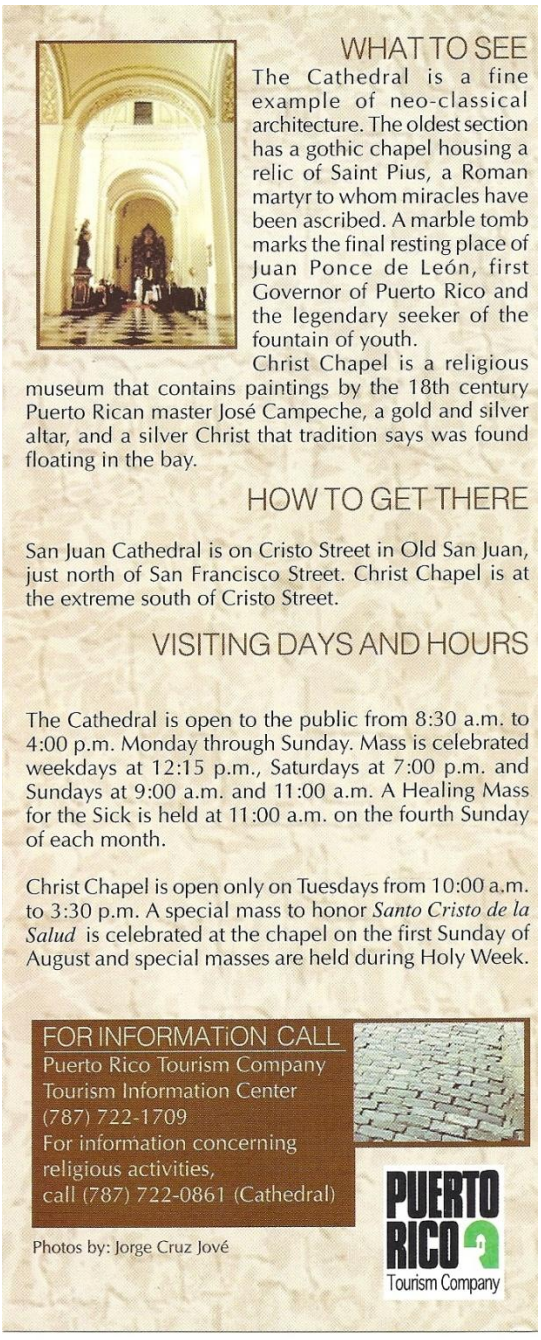
For more than 477 years, the faithful in San Juan have sought serenity at their supreme house of worship, the Cathedral of San Juan. First built in 1521 by the Spanish colony's first bishop, Alonso Manso, the thatched wooden church was blown away by a hurricane in 1526. A new temple, built from stone dragged by horse from inland quarries, was completed in 1529, in time for the first ordination of a bishop performed in the New World.

By 1865, 344 years and 48 bishops later, the Cathedral assumed its current form, although major restorations were performed under Bishop William Jones in 1917, and then under Puerto Rico's first cardinal, Luis Aponte Martínez, in the 1970s.

CHRIST CHAPEL

Conflicting stories account for the existence of the small chapel at the south end of Cristo Street. It was built in 1753 to either commemorate a miracle or to prevent further tragedy. Young men raced horses down the hill as part of the San Juan Bautista festivities. In one version, a horse and rider went over the wall to their certain death. A witness cried out to Christ to save the man and miraculously he survived. In another version, he perished. In any case, it became a center of devotion where the faithful left offerings of gold and silver. The offerings were molded into an elaborate altar, picture frame, candelabras and other religious objects that are now on display.

Figure 24: San Juan Cathedral and Christ Chapel Brochure View 1



WHAT TO SEE

The Cathedral is a fine example of neo-classical architecture. The oldest section has a gothic chapel housing a relic of Saint Pius, a Roman martyr to whom miracles have been ascribed. A marble tomb marks the final resting place of Juan Ponce de León, first Governor of Puerto Rico and the legendary seeker of the fountain of youth.

Christ Chapel is a religious museum that contains paintings by the 18th century Puerto Rican master José Campeche, a gold and silver altar, and a silver Christ that tradition says was found floating in the bay.

HOW TO GET THERE

San Juan Cathedral is on Cristo Street in Old San Juan, just north of San Francisco Street. Christ Chapel is at the extreme south of Cristo Street.

VISITING DAYS AND HOURS

The Cathedral is open to the public from 8:30 a.m. to 4:00 p.m. Monday through Sunday. Mass is celebrated weekdays at 12:15 p.m., Saturdays at 7:00 p.m. and Sundays at 9:00 a.m. and 11:00 a.m. A Healing Mass for the Sick is held at 11:00 a.m. on the fourth Sunday of each month.

Christ Chapel is open only on Tuesdays from 10:00 a.m. to 3:30 p.m. A special mass to honor *Santo Cristo de la Salud* is celebrated at the chapel on the first Sunday of August and special masses are held during Holy Week.

FOR INFORMATION CALL
Puerto Rico Tourism Company
Tourism Information Center
(787) 722-1709
For information concerning
religious activities,
call (787) 722-0861 (Cathedral)

Photos by: Jorge Cruz Jové

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Figure 25: San Juan Cathedral and Christ Chapel Brochure View 2

APPENDIX G: University of Puerto Rico Botanical Garden

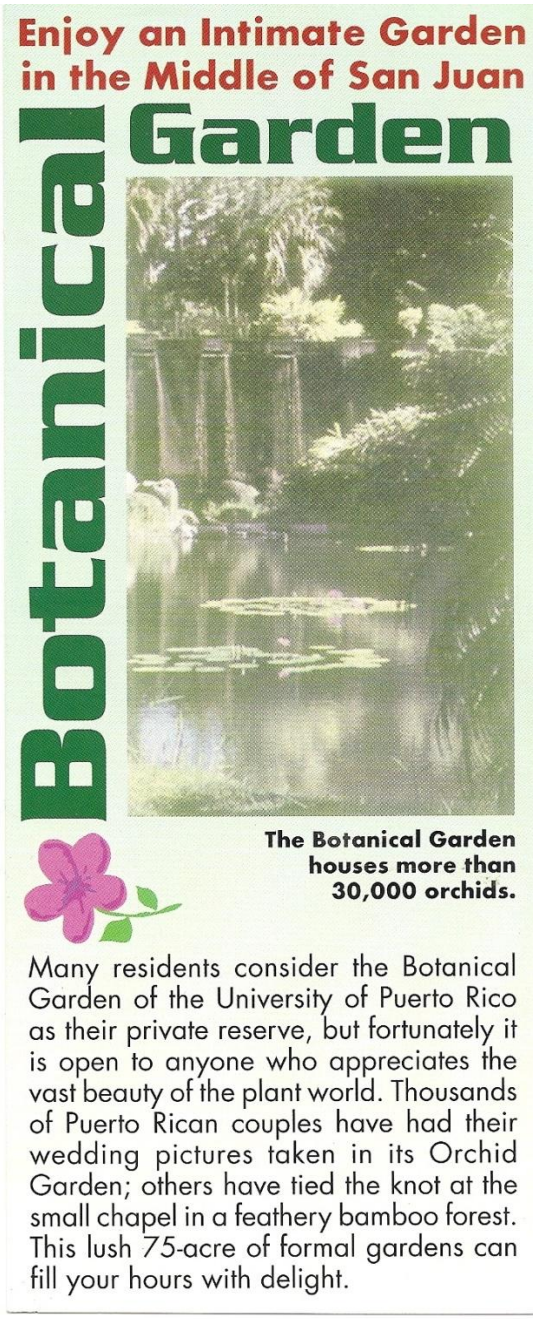
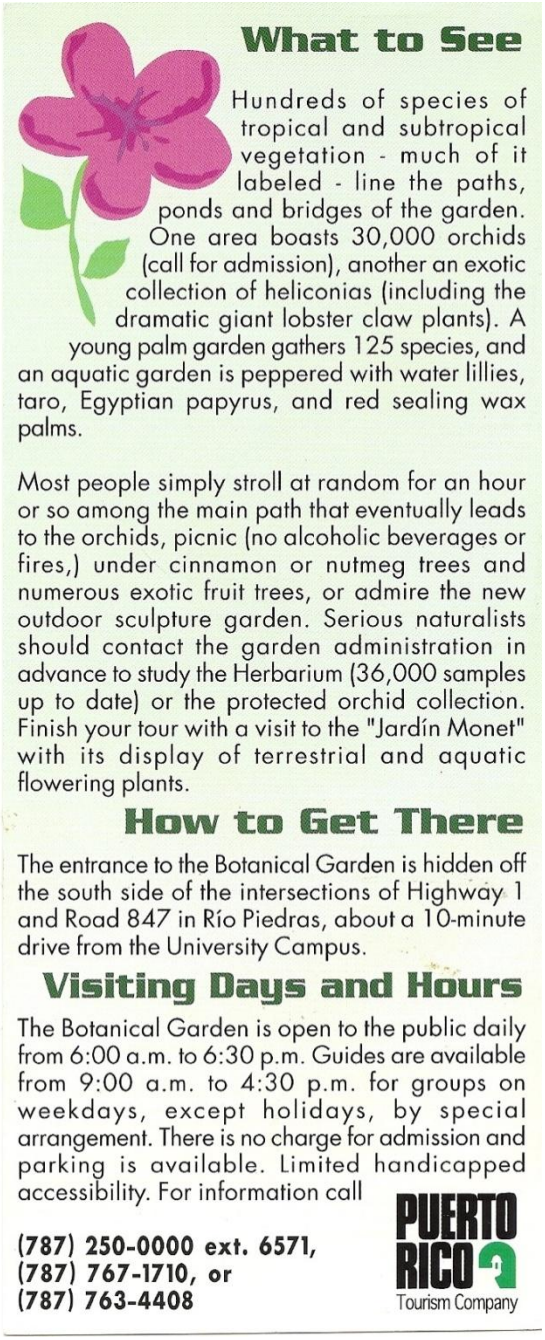


Figure 26: University of Puerto Rico Botanical Garden Brochure View 1



What to See

Hundreds of species of tropical and subtropical vegetation - much of it labeled - line the paths, ponds and bridges of the garden. One area boasts 30,000 orchids (call for admission), another an exotic collection of heliconias (including the dramatic giant lobster claw plants). A young palm garden gathers 125 species, and an aquatic garden is peppered with water lillies, taro, Egyptian papyrus, and red sealing wax palms.

Most people simply stroll at random for an hour or so among the main path that eventually leads to the orchids, picnic (no alcoholic beverages or fires,) under cinnamon or nutmeg trees and numerous exotic fruit trees, or admire the new outdoor sculpture garden. Serious naturalists should contact the garden administration in advance to study the Herbarium (36,000 samples up to date) or the protected orchid collection. Finish your tour with a visit to the "Jardín Monet" with its display of terrestrial and aquatic flowering plants.

How to Get There

The entrance to the Botanical Garden is hidden off the south side of the intersections of Highway 1 and Road 847 in Río Piedras, about a 10-minute drive from the University Campus.

Visiting Days and Hours

The Botanical Garden is open to the public daily from 6:00 a.m. to 6:30 p.m. Guides are available from 9:00 a.m. to 4:30 p.m. for groups on weekdays, except holidays, by special arrangement. There is no charge for admission and parking is available. Limited handicapped accessibility. For information call

(787) 250-0000 ext. 6571,
(787) 767-1710, or
(787) 763-4408

PUERTO RICO
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Figure 27: University of Puerto Rico Botanical Garden Brochure View 2

APPENDIX H: Voice of the Land

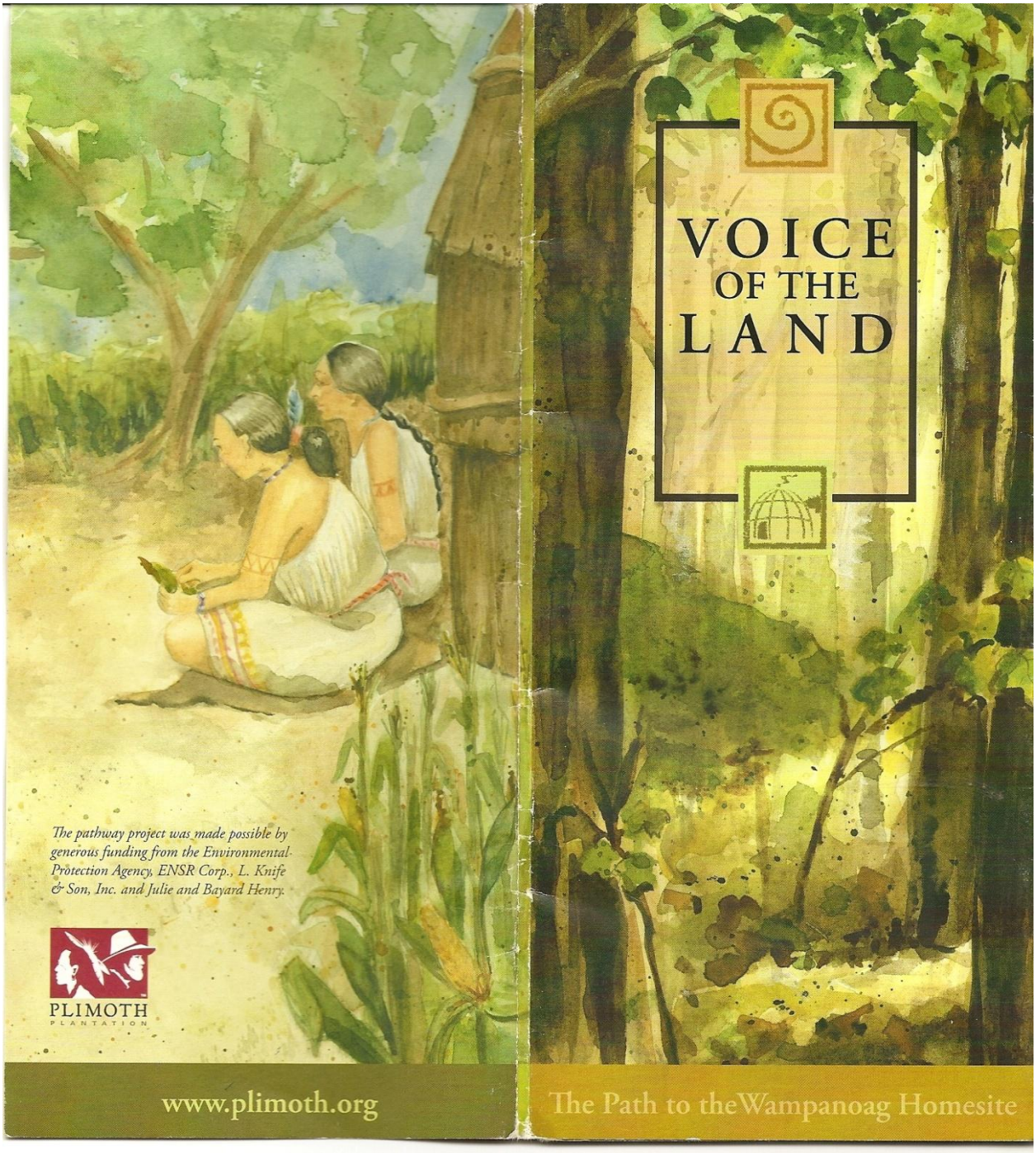

Figure 28: Voice of the Land Brochure View 1

journey

As you step on to the woodland path to the Wampanoag Homesite, you begin a journey through a landscape in transition and an exploration of human interaction with nature. The path runs through old agricultural fields that had been overrun for decades with oriental bittersweet, bush honeysuckle and multiflora rose. Their removal has opened up areas for new plantings designed to evoke a feeling of being immersed in the natural environment.

Feel free to walk the path at your own pace and ponder the lessons of the six landscapes along its route. Each may inspire you to look at nature in a different way. At the end of your journey, you will enter the Wampanoag Homesite, located in the part of the Wampanoag homeland called Patuxet. There you will meet indigenous people who can teach you the woodland path's most important lesson, how their respect for nature has sustained them on this land for thousands of years.

illustrations by Sandra Pirie-St.Amour © 2007

forest

The pathway begins in a forested area of tall oak and maple trees. Their branches cast shade and provide a sense of shelter as you pass beneath them. This is the home of animals such as screech owls, squirrels, and chickadees as well as a host of insects and microorganisms that are important to the forest's health.

The oaks are native trees common to New England's woodland. The maples are Norway maples, a European species, and are part of Plimoth Plantation's original landscaping from the early 20th century. Most of them are in poor condition due to damage suffered during the construction of the Visitor Center. An understory of young white pines, black oaks and American hollies has been planted beneath them and will eventually overgrow them.

It is important to remember that forest habitat isn't made up of just healthy straight trees of one species. Fallen trees, stumps and saplings of many kinds all play a role in the forest's ecological balance.

Figure 29: Voice of the Land Brochure View 2

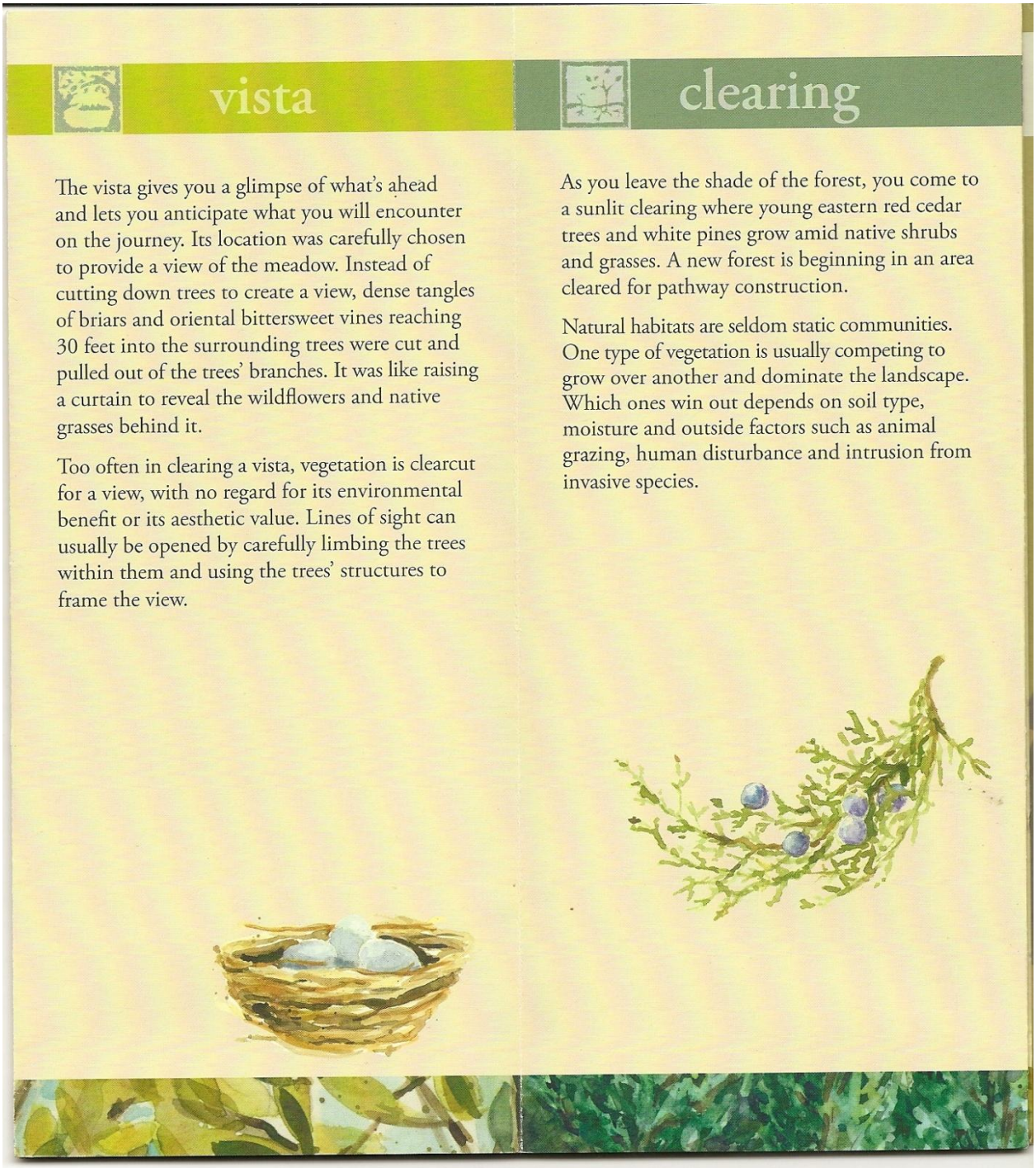

Figure 30: Voice of the Land Brochure View 3

meadow

The meadow is a combination of native grasses and wildflowers planted in 2005. Its diverse colors and textures provide visual and emotional enjoyment as you travel the path. It may also evoke a subconscious connection to a time when our ancestors moved from the shelter of the forest out into open grasslands to take advantage of new sources of food.

For plants, insects and animals, meadows provide opportunities for nourishment, reproduction and advancing to the next stage of life, as when the larva of a Monarch butterfly emerges from its chrysalis as an adult butterfly, or when a New England aster seedling, growing in a tight rosette on the ground one year, sends up clusters of tall stems topped with purple flowers the next year.

gathering circle

Spend a moment in the Gathering Circle, a meditative spot to rest on your journey. The large rocks that make up the circle not only serve as seats, but also offer a story of their own. They are set to point to the four cardinal directions, north, east, south and west, which indigenous people understand as elements of Creation carrying certain meaning and power.

The large stone of white quartz faces east to greet and reflect the first light of day. Going clockwise, a granite stone bears a natural stripe pointing directly south, where the summer warmth originates to bring forth the corn. Rusty colored due to its iron content, the west-facing granite reveals a strength akin to the direction which brings the night, the rain and storms. Another granite points a vein of green quartz directly north, from where the winter snows arrive to blanket Earth in her time of rest.

Four smaller stones sitting between the larger complete the circle. Note the pudding stone that faces northeast. Formed in antiquity as glaciers receded, stone and sediment were dragged and compacted into final form. The center stone, as well, bears glacial markings, grooves now aligned to draw energy between earth and sky.

Traditional indigenous cultures believe that nothing in the world was created without meaning, a concept that was acknowledged and incorporated into a philosophy and structure of living.

Figure 31: Voice of the Land Brochure View 4

wetlands

Beyond the Gathering Circle, the woodland path runs through the freshwater wetland of Eel River Pond. It is a habitat rich with animal and plant life and provides important benefits to the environment by containing storm water run-off, filtering out pollution and allowing rainwater to seep slowly into the soil and replenish the aquifer.

While the Eel River Pond is one of our most valuable ecosystems, it is also one of our most vulnerable. Its biodiversity is threatened by large colonies of the invasive reed *Phragmite australis* growing around its shores. Controlling Phragimites and other invasive species is a priority of Plimoth Plantation in cooperation with Corporate Wetlands Restoration Partnership, the Town of Plymouth, and ENSR Corporation.

homesite

Summers brought families out of the winter villages, to ancient planting grounds on the coasts and banks of rivers. Planting, gathering, hunting and fishing were ways of life carried on for millennia here in Patuxet, and all of Wampanoag country as well. Life was stable, steady and secure, as people understood natural law and followed the rhythms of seasons. Seeing themselves as part of the land, and the land as part of them provided the knowledge to tend to every need while protecting what Creator had given them.

The Wampanoag Homesite is in such a place on the edge of the Eel River. The ancestors came here for generations following generations. They reveal themselves in many ways: in shell middens found when digging holes for new corn watch poles; with arrowheads emerging from rain-gouged rivulets, or surfacing in the spring turning of garden soil.

The Homesite staff are the children of those ancestors, most being Wampanoag and some from other indigenous nations. All do the same things that the ancestors did. The daily practice of ancient skills such as house-building, cooking, weaving, or making boats brings insight and understanding to our traditional life.

It is a place where the past is held and retold; where certain traditions have re-emerged as they were done centuries ago, to be carried into the future. The indigenous Wampanoag people have returned to old Patuxet, being here in this place of our ancestors and continuing ancient ways.

Figure 32: Voice of the Land Brochure View 5

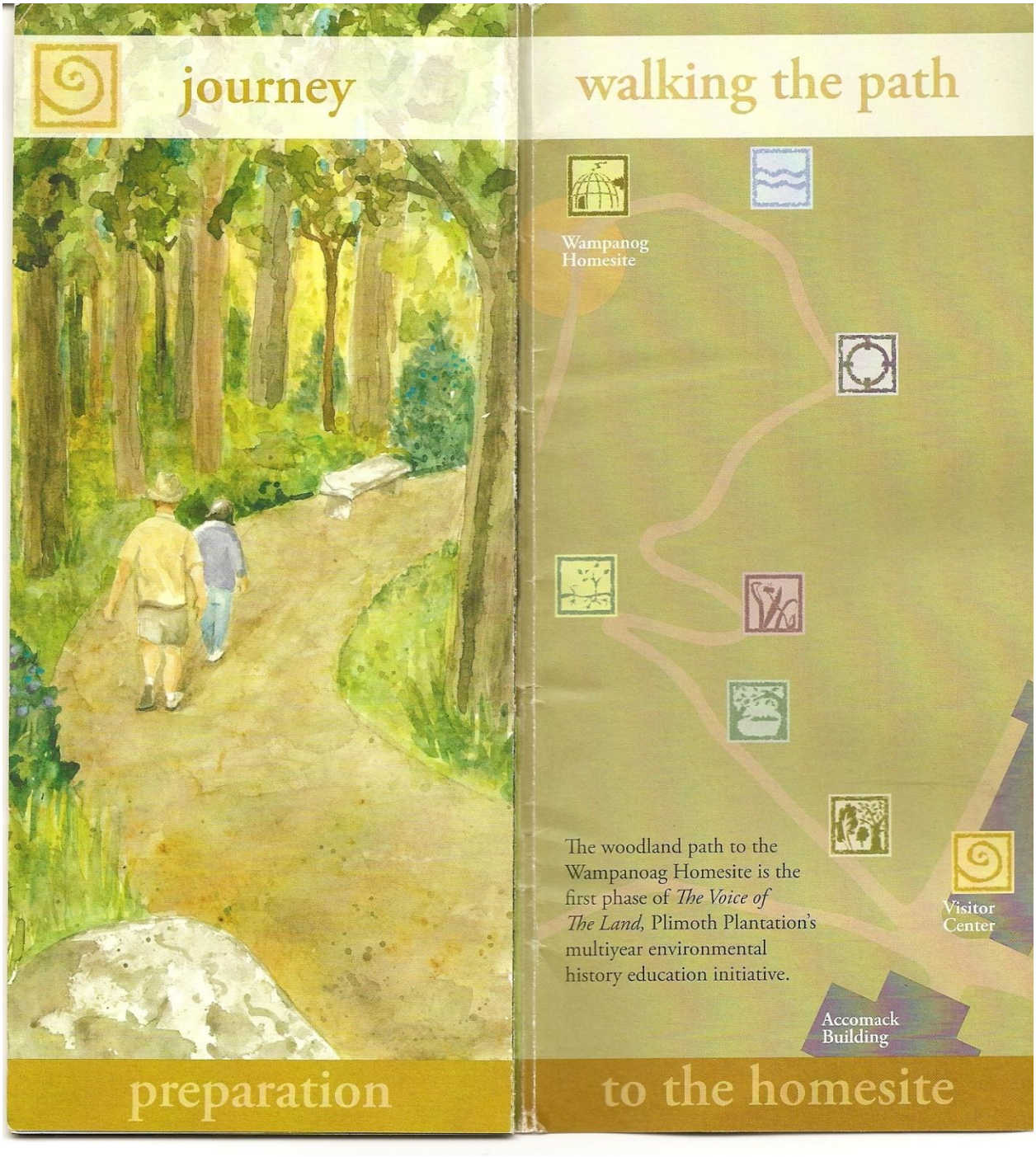

Figure 33: Voice of the Land Brochure View 6

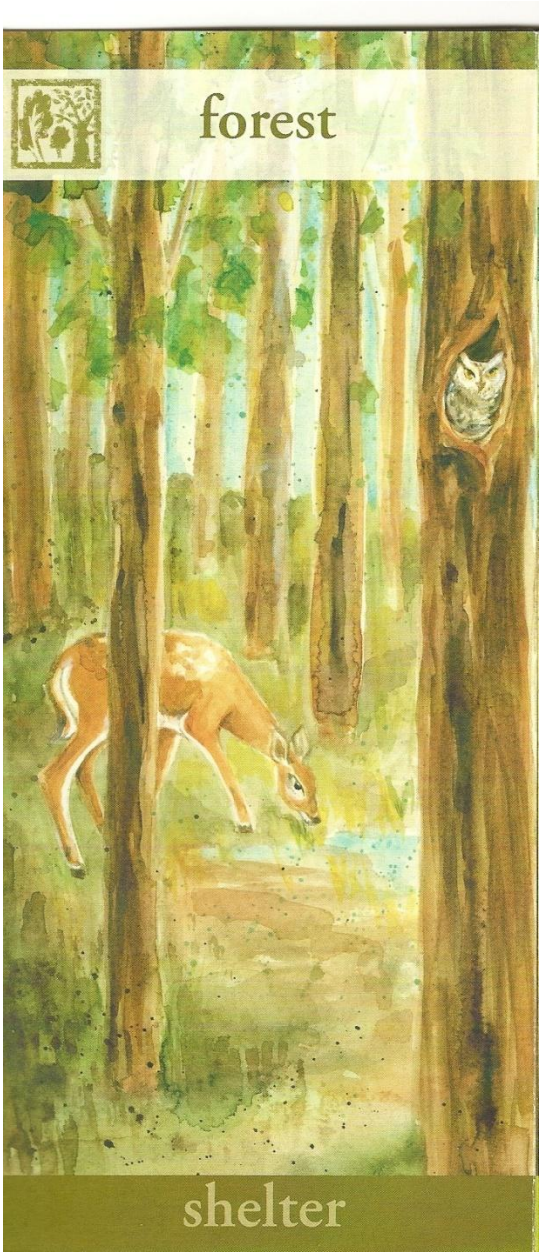

Figure 34: Voice of the Land Brochure View 7

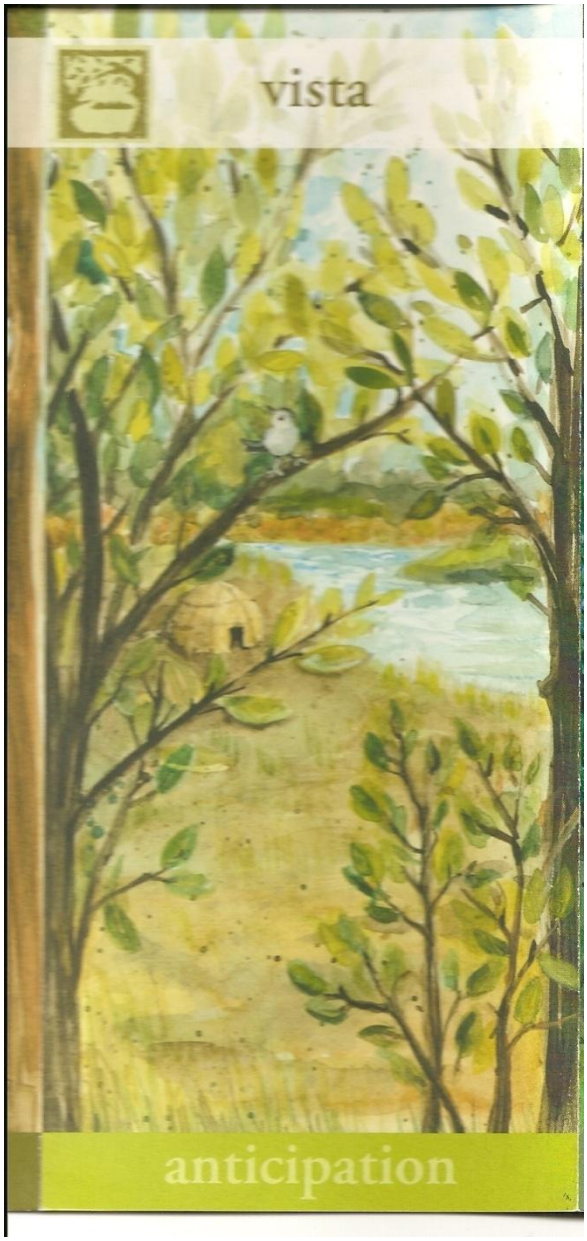

Figure 35: Voice of the Land Brochure View 8

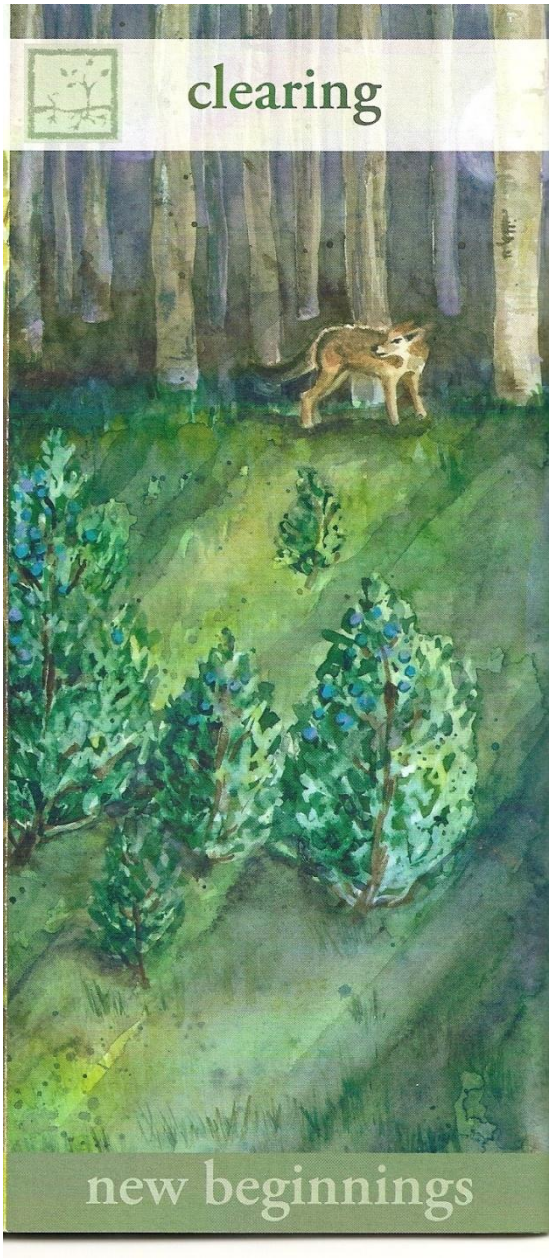

Figure 36: Voice of the Land Brochure View 9

Figure 37: Voice of the Land Brochure View 10

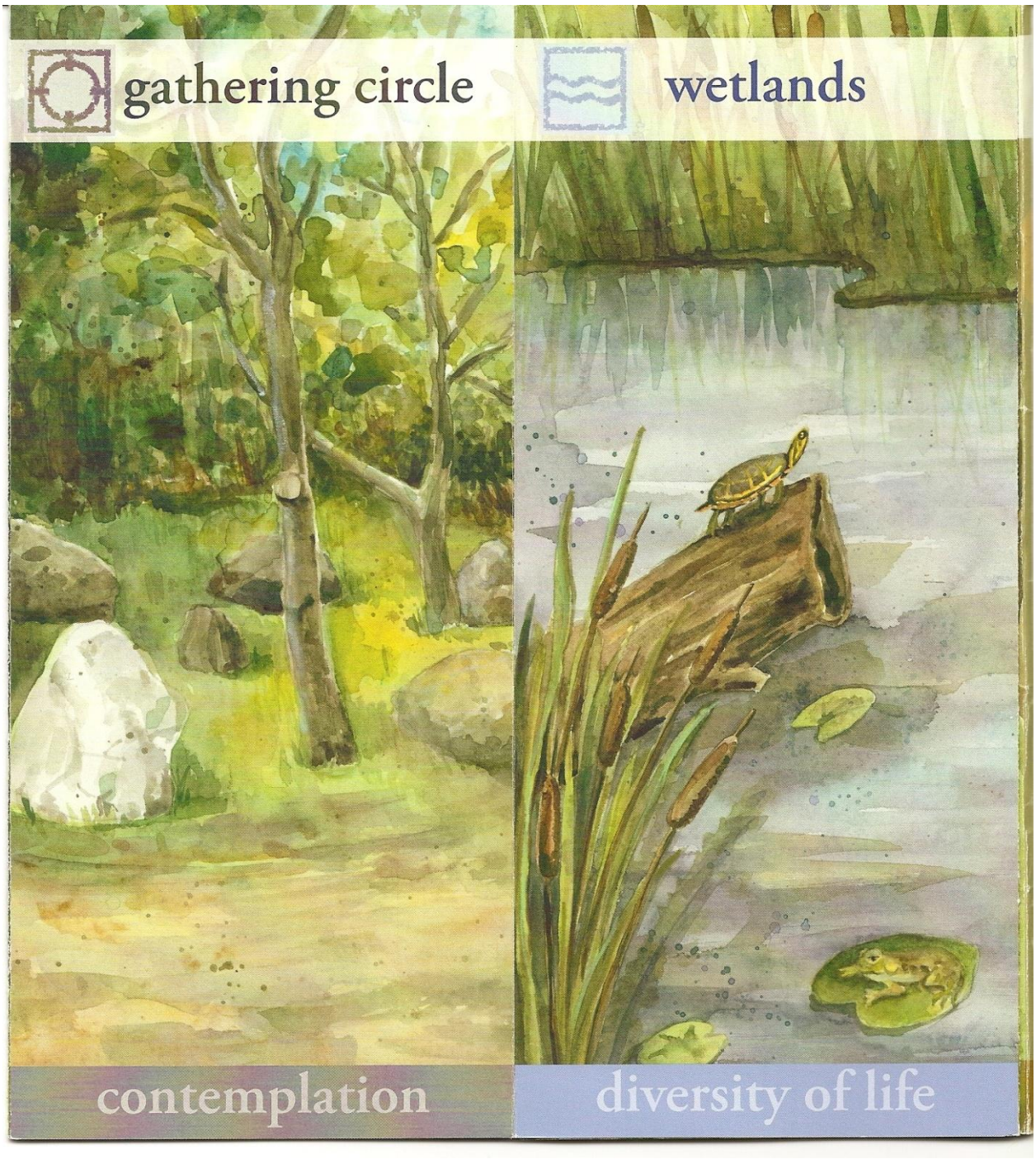

Figure 38: Voice of the Land Brochure View 11

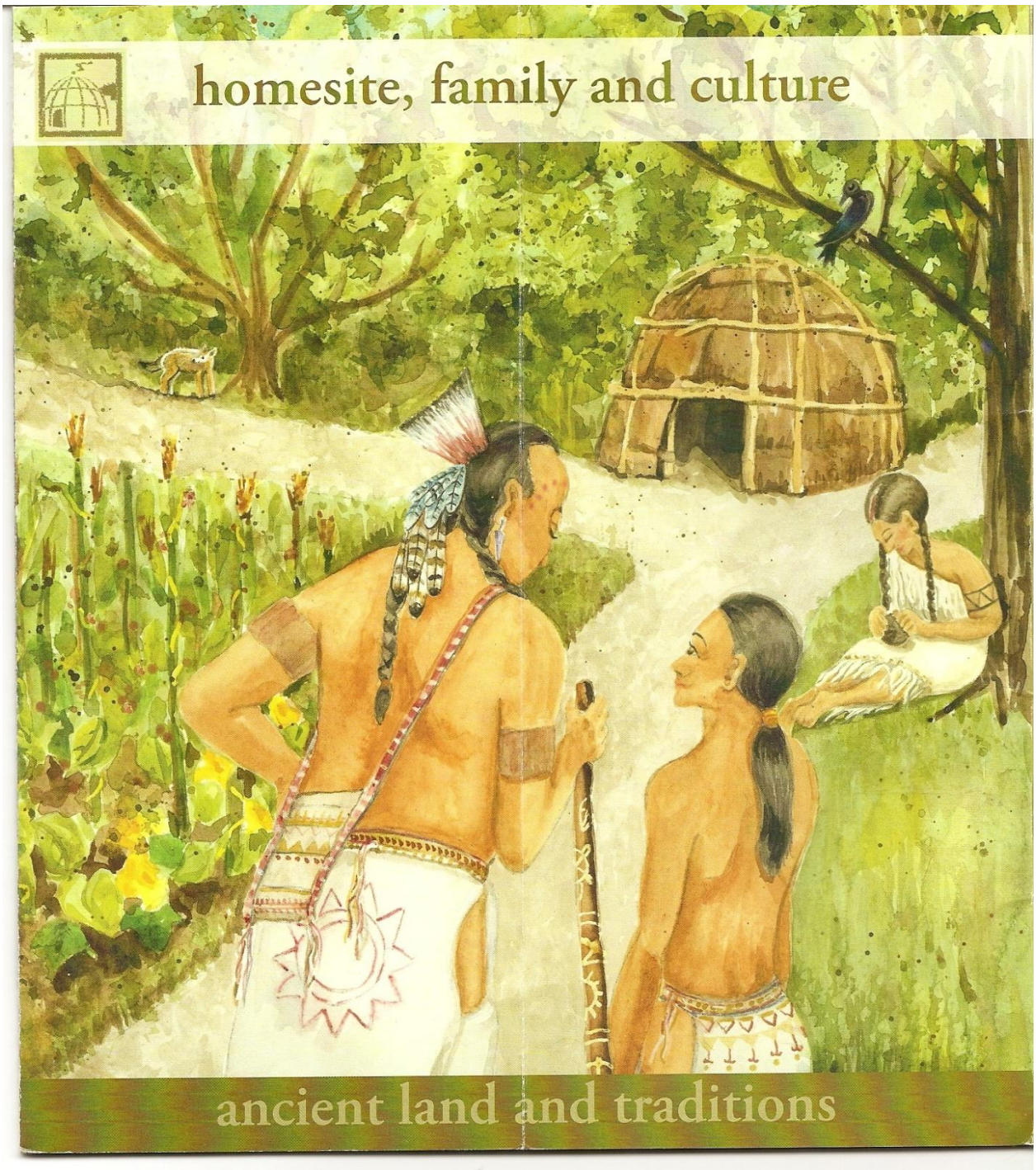

Figure 39: Voice of the Land Brochure View 12

APPENDIX I: Forts of Old San Juan

Figure 40: El Morro Brochure View 1

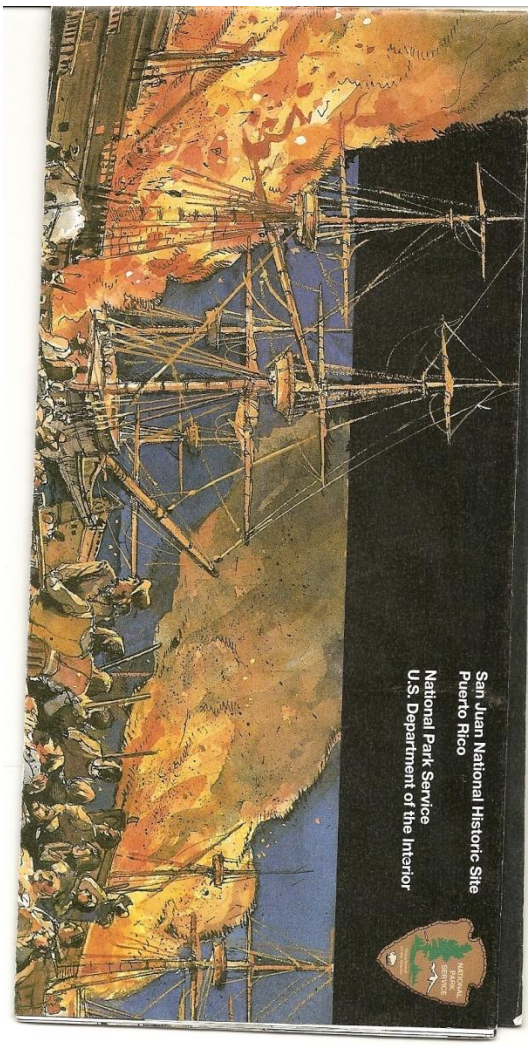

Figure 41: El Morro Brochure View 2

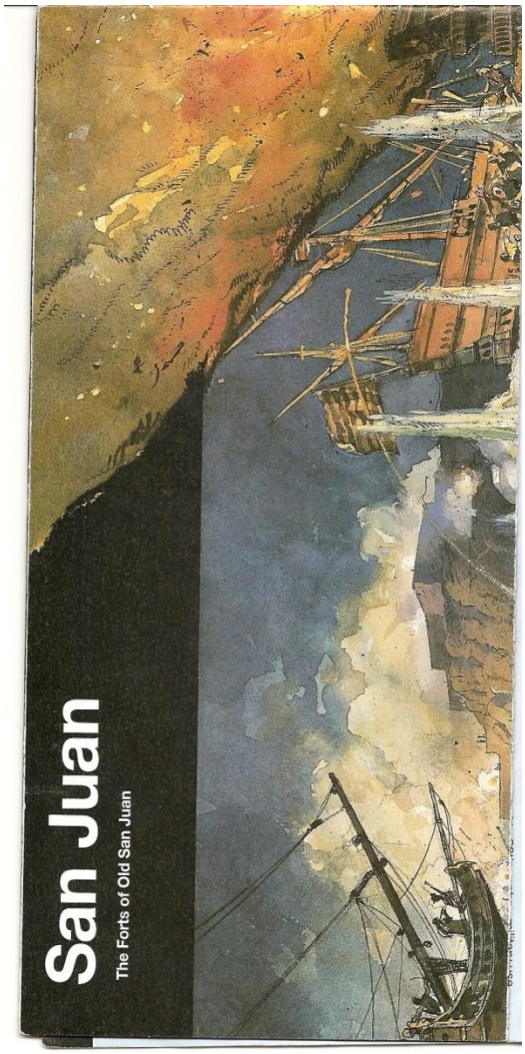

Figure 42: El Morro Brochure View 3

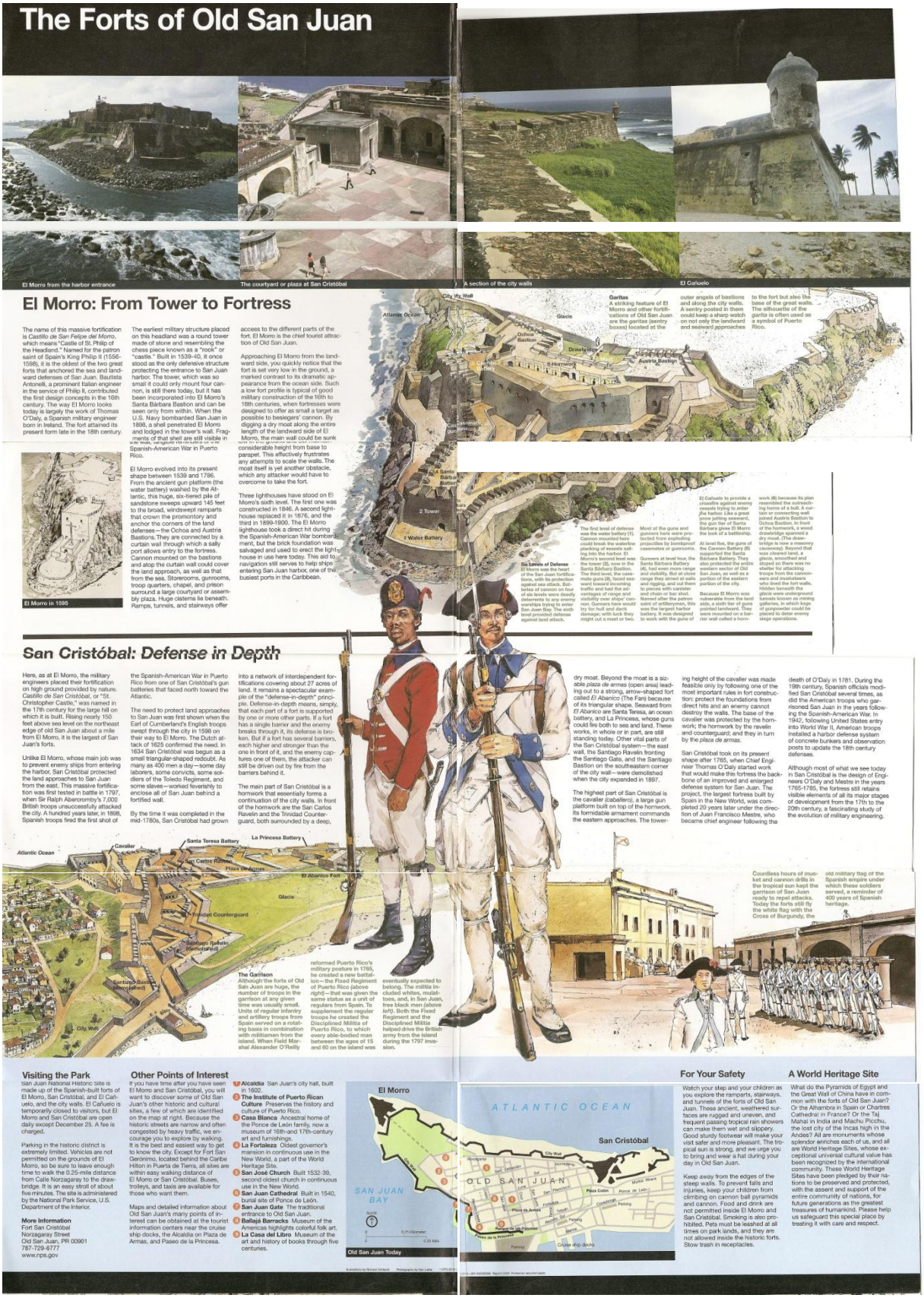

Figure 43: El Morro Brochure View 4

APPENDIX J: Glossary

All terms were defined using the following publications: *The Puerto Ricans in America*; *Taínos of Puerto Rico, a cultural site*; *Twenty-fifth annual report of the Bureau of American Ethnology: to the Secretary of the Smithsonian Institution*; *Talking Taíno: essays on Caribbean natural history from a native perspective*; and a document from Mr. Glogiewicz titled *Arboles Tainos – Guajataka*.

Arawak (*Noun*):	Taínos originated from this tribe; native to modern day Venezuela.
Areytos (*N*):	Elaborate ceremonies often of religious significance that were held on a variety of occasions, from a death to the visit of an important guest.
Batey (*N*):	A ceremonial game involving a rubber ball and 20-30 people. Additionally, it is the name for the court or field where the game is played.
Batos (*N*):	A rubber ball made by the Taínos for the game of Batey.
Behique (*N*):	A priest or medicine man.
Bija (*N*):	Taíno name for the red dye made from the fruit of Achiote tree. Also is the name of the tree.
Boriquen (*N*):	Taíno name for island, known today as Puerto Rico, meaning "the land of the brave men".
Colisibi (*N*):	A necklace made by interspersing small stone and seeds of Corozo (Taíno name - Aovara) tree.
CBCG (*N*):	Caguas Botanical and Cultural Garden.
Cemi (*N*):	A God or an object that represents a God.
Cojoba/cohoba (*N*):	A snuff made from the smashed seeds of Cojóbana tree.
Conucos (*N*):	Slash and burn fields cultivated by Taíno women.
Cuisa (*N*):	A small shovel that was used to stir the cassava bread.
Duho (*N*):	A seat used by the Cacique or Behique during religious ceremonies.
FoRTS (*N*):	Back to Our Forest Roots Trail System.
Gratú (*N*):	Fire.

Guada (*N*): A Taíno house garden.

Guanabina (*N*): Taíno name for fruit from the Corozo tree.

Guayo (*N*): A grater board used to shred the Yuca for cassava bread.

Jibaros (*N*): A Spanish peasant or small farm owner in early Puerto Rico.

Macana (*N*): A war club.

Naborias (*N*): The lower, working Taíno class.

Naguas (*N*): A frontal apron worn by married women. The length shows the social status of a Taínos.

Naho (*N*): Paddles used by the Taínos.

Nitaínos (*N*): The noble, ruling Taíno class.

Opia (*N*): The spirits of the dead.

Taíno (*Adjective*): Of relating to the people of Arawak tribe.

(*N*): The language used by the Taínos.

Taínos (*N*): Of relating to the Taíno people.

Uicu (*N*): A beer made from the Yuca tree.

Yucayeques (*N*): Name of the Taíno villages, usually based around a central plaza, while the exterior of the town was surrounded by tall walls and watchtowers.

APPENDIX K: Plant List

See pages K1 - K22 below.

APPENDIX L: Brochure

See following pages.

List of plants and usages in Caguas Botanical and Cultural Garden

* Usage that is specifically Taínos colored in light green

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Flower Orchard										
Ylang-ylang *Cananga odorata*	Flowers and fruits throughout most of the year.	Trunk can be used to make small canoes and drums. The volatile oil produced from the flower of this tree can be used in perfumes.				Trunk-*canoe, drum*				[Little & Wadsworth, 1964, p.106]
Red ginger *Alpinia purpurata*	Blooms throughout the whole year.[1]	The nectar of the flowers attracts bees, butterflies, and birds. [2]		Nectar-*hunting*						[1][Llamas, 2003,p.362] [2][National Tropical Botanical Garden [NTBG], 2004b]
Cerezo, Cereza, Capulin *Prunus salicifolia*	Flowers from January to May. Fruits from May to September.	Fruits are eaten or stewed. Seeds are made into oil for soap and paints. Flowers are visited by honeybees. Wood is very hard, strong and durable. It is used in furniture and has other carpentry usages.		Fruit		Wood-*carpentry* Seed oil-*soap, paint*		Wood-*furniture*		[Morton, 1987, p. 109]
Lady Di *Heliconia psittacorum*	Blooms all year long. Flowers last days to months.	“Hummingbirds are the exclusive pollinators of red, yellow , pink and orange heliconias while nectar feeding bats are the pollinators of green heliconias.”		Nectar-*hunting*						[NTBG, 2003]
Heliconia wagneriana	Long blooming season from January to September, primarily in spring.	“Hummingbirds are the exclusive pollinators of red, yellow , pink and orange heliconias while nectar feeding bats are the pollinators of green heliconias.”		Nectar-*hunting*						[NTBG, 2004e]
Red torch *Etlingera elatior*	Flowers continuously all year long.									[Whistler, 2000,p.195]
Insulin plant *Costus igneus*	Flowers in summer.[1]	Leaves' extract has potential anti-diabetic effect.[2]			Leaf					[1][Ogden, 2007,p.332] [2][Patil, 2010]
Palma adonidea *Veitchia merrillii*	Fruits during the fall and winter	This tree is ornamental.						Leaf, Trunk-*construction*		[Scheper, 2003]

List of plants and usages in Caguas Botanical and Cultural Garden

* Usage that is specifically Taínos colored in light green

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Flower Orchard										
Ceiba *Ceiba pentandra*	Seed capsules mature in spring and summer[1]	Can be made into drums. Additionally, plants and other trees grow in the shade of this tree.[1]	Taínos used the tree for drums and canoes. [2]			Wood-***drum, canoe***		Tree -*shade*		[1][Little & Wadsworth, 1964, p.332] [2][Keegan & Carlson, 2008, p.112; Glogiewicz, Personal communication, March 16, 2010]
Fruit Orchard										
Canistel, Eggfruit, Yellow sapote *Pouteria campechiana*		Fruit can be eaten fresh or baked. In Mexico, the bark helps to reduce fever. In Cuba it is used to cure skin problems. Ulcers can be healed using the seeds. It can be considered a timber tree due to it's compact and strong wood .		Fruit	Bark, seed	Wood		Wood		[NTBG, 2005b]
Acerola *Malpighia emarginata*	Flowers throughout the year, but flowering is usually associated with rain. Fruit matures within 25 days .	Fruit is edible and is high in Vitamin C. Sour taste is utilized in seasoning.		Fruit					  	[California Rare Fruit Growers, Inc. [CRFG], 1996a]
Noni *Morinda citrifolia*	Flowers and fruits nearly all year.	Bark is used to make red dye. Fruits can be eaten or feed to hogs. Leaves can be heated to reduce painful swelling or can be reduced to pulp for wounds or headaches. Leaves are crushed in lard or camphor oil and applied on the face to treat neuralgia or head colds.		Fruit	Leaf		Bark - *red dye*		 	[Little & Wadsworth, 1964, p.518]
Citrus	Flowers in spring to July. Fruits mature in summer and fall.	Food and beverages can be made from the fruit.		Fruit						[Little & Wadsworth, 1964, p.218]

List of plants and usages in Caguas Botanical and Cultural Garden

* Usage that is specifically Taínos colored in light green

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Fruit Orchard										
Peach Palm *Bactris gasipaes*	Fruit is harvested from November to March.[1]	Fruit can be eaten and contains vitamins, protein, and starch. Fruit can also be cooked in boiling water and can be pounded into flour. The fruit can be fermented for longer storage.[2]		Fruit						[1][Palm & Cycad Societies of Florida, Inc., n.d.] [2][NTBG, 2007]
Star fruit *Averrhoa carambola*	This tree bloom several times per year.[1]	Fruit can be eaten fresh or cooked and can be used to counteract fevers, biliousness, diarrhea, and relieve eye afflictions. The fruit helps to quench thirst, increase secretion of saliva, coughing, sore throat, malaria, and food poisoning. The leaf can be used to treat colds, gastroenteritis, traumatic injury, boils, and postpartum edema. While the root treats chronic headaches and epitasis. The flower is also used for fever and malaria.[2]		Fruit	Flower, fruit, leaf, root				  	[1][CRFG, 1996b] [2][Sung, Kimura, But & Guo, 1998, pp.75-76; NTBG, 2004c]
Candle nut *Aleurites moluccana*		Roasted nuts can be eaten. Flowers can be used to heal thrush or sores inside the mouth. Sap also helps heal thrush as well as to treat chapped lips, cold sores and mild sunburns. Bark can be used for tumors. While the kernel is a laxative stimulant and sweat inducer. Oil is also used as hair stimulant.		Nut	Bark, flower, kernel, oil, sap					[NTBG, 2004a]
Garcinia mangostana	In full sun it will fruit in July through August. While in shade it will fruit in November through December.	Fruit can be eaten raw, while the seeds are eaten after boiling or roasting. Fruit rinds are used for tanning leather and processed into black dye. The fruit is dried and the rind is powdered for dysentery. It is also made into ointment for eczema and other skin disorders. “The rind decoction is taken to relieve diarrhea and cystitis, gonorrhea and gleets and is applied externally as an astringent lotion." Spear handles and rice pounders are made from the heavy yet durable wood.		Fruit, seed	Fruit, rind	Rind -*tanning*, Wood-*spear handle, rice pounders*	Rind - *black dye*	Wood-*construction*		[Morton, 1987, pp.303-304]

List of plants and usages in Caguas Botanical and Cultural Garden

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Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Fruit Orchard										
Guava **Guayaba**[1] *Psidium guajava*	Flowers and fruits throughout the year.[2]	Fruit can be eaten and is rich in vitamin C. The bark is utilized for tanning. All parts of the tree except the fruit and flower can be used in folk medicine.[2]	Grown in Taíno guada.[3] Fruit was eaten by the Taínos. [4]	**Fruit**	Bark, buds, leaf, root	Bark -*tanning*			 	[1][Aquino, 1977,p.228][2][Little & Wadsworth, 1964, p.416] [3][Keegan & Carlson, 2008, p.79] [4] [Glogiewicz, Personal communication, March 16, 2010]
Miracle fruit *Synsepalum dulcificum*	Flowers appear throughout many months of the year	The fruit can be eaten and is known to cover the taste buds for about 30 minutes so the user can eat citrus without being effected by the sour taste.		Fruit						[CRFG, 1996c]
Cashew **Cajuil**[1] *Anacardium occidentale*	Flowers from February to May. Fruits from April to August. [2]	Used the bark in tanning. The gum of the tree can be made into an insect repellant. Roasted nuts can be eaten after roasting, while the fruit can be eaten fresh. The fruit is also used in preparation to make wine and vinegar.[2]	Fruit and nuts were eaten by Tainos.[3] The Taínos would plant this tree in the conucos.[4]	**Fruit, nut**	Gum -insect repellent	Bark -*tanning*			 	[1][Aquino, 1977, p.110] [2][Little & Wadsworth, 1964, p.286] [3][Glogiewicz, Personal communication, March 16, 2010] [4][Glogiewicz, Personal communication, April 14, 2010]
China, sweet orange *Citrus sinensis*	Flowers in spring, fruits in the fall.	Fruit can be eaten and is rich in vitamin C. The peel of the fruit can be candied and produces oil when pressed. The oil can then be used for flavoring.		Fruit, rind						[Little & Wadsworth, 1964, p.226]
Bread fruit *Artocarpus altilis*	Flower and fruit throughout the year.	The sap is sticky enough to be used to catch birds. Mature fruit and seeds can be boiled or roasted while the younger fruits can be fried.		Fruit, seed		Sap -*catch birds*				[Little & Wadsworth, 1964, p.60]
Soursop **Guanábana**[1] *Annona muricata*	Flowers from June to October and fruits in the fall.[2]	Fruit can be eaten fresh or made into drinks or ice cream. Leaves, flowers, fruits, and seeds can be used for medicine. Leaves can also repel lice.[2]	Grown in Taíno guada.[3] Fruit eaten by Taínos while leaf, flower, fruit, seed were used for medicine. [4]	**Fruit**	**Flower, fruit, leaf, seed**, Leaf -*insecticide*				 	[1] [Aquino, 1977, p.208] [2][Little & Wadsworth, 1964, p.100] [3][Keegan & Carlson, 2008, p.79] [4][Glogiewicz, Personal communication, March 16, 2010]

List of plants and usages in Caguas Botanical and Cultural Garden

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Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Fruit Orchard										
Hog plum **Jobo**[1] *Spondias mombin*	Flowers from winter to summer. Fruits from summer to winter.[2]	Fruit can be eaten or fed to hogs or cattle. This tree is a honey plant and the wood can be used as fuel.[2]	In the legend of the origin of the world, those that went fishing were turned into this tree by the sun.[3] The Taínos enjoyed the fruit as food. [4]	**Fruit**		Wood -*fuel*				[1][Aquino, 1977, p.288] [2][Little & Wadsworth, 1964, p.294] [3][Arrom, 1998, p. 72; Fewkes, 1907, p.74] [4] [Glogiewicz, Personal communication, March 16, 2010]
Avocado **Aguacate**[1] *Persea americana*	Flowers from January to May. Fruits from June to October.[2]	The fruit is nutritious and can be eaten fresh or made into oil. The leaves, seeds, fruit, rind, and the bark can be used in folk medicine. This tree is a honey plant and the reddish-brown dye from the seeds dyes clothes.[2]	Taínos did not give avocados much care according to the Spaniards.[3] The fruit of this tree was eaten by the Taínos, while the bark, fruits, leaves and seeds were used in medicine. [4] The Taínos would plant this tree in the forest garden. [5]	**Fruit**	**Bark, fruit, leaf**, rind, **seed**		Seed - *reddish-brown dye*			[1][Aquino, 1977, p.34] [2][Little & Wadsworth, 1964, p.128] [3][Keegan & Carlson, 2008, p.78][4] [Glogiewicz, Personal communication, March 16, 2010] [5][Glogiewicz, Personal communication, April 14, 2010]
Chocolate-tree **Cacao**[2] *Theobroma cacao*	Flowers in summer and fall. Fruits in spring and summer.[1]	The seeds are ground and roasted into chocolate. The chocolate produced from the seeds is made into candies, desserts, and drinks. Seeds were used as currency by some natives. [1]	Taínos consumed the fruit and utilized it in medicine. [2]	**Seed**	**Seed**				 	[1][Little & Wadsworth, 1964, p.342] [2][Glogiewicz, Personal communication, March 16, 2010]
Níspero,Sapodilla **Chicozapote**[4] *Manilkara zapota*	Flowers and fruits throughout the year.[1]	The tree is used as a shade tree and the sap can be processed into gum. Fruit can be eaten fresh or be preserved and made into syrup.[1]	Grown in Taíno guada.[2] The fruit was eaten by the Taínos. [3]	**Fruit**, Sap- *gum*				Tree-*shade*	 	[1][Little & Wadsworth, 1964, p.446] [2][Keegan & Carlson, 2008, p.79] [3][Glogiewicz, Personal communication, March 16, 2010] [4][Glogiewicz, Personal communication, April 26, 2010]
Almendra, Indian-almond tree *Terminalia catappa*	Flowers and fruits throughout the year.	The outer layer of the fruit is edible. The tree is utilized for posts, fuel, and construction. The bark, roots, green fruits, and leaves can be used for tanning. The bark, fruits and foliage can be made into black dye while the seeds are used to extract oil.		Fruit		Bark, root, green fruit, leaf -*tanning,* Wood-*post, fuel*	Bark, fruit, foliage -*black dye*	Wood- *construction*		[Little & Wadsworth, 1964, p.394]

List of plants and usages in Caguas Botanical and Cultural Garden

* Usage that is specifically Taínos colored in light green

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Fruit Orchard										
Caimito[3] *Chrysophyllum cainito*	Flowers in summer and fall. Fruits from late fall to summer.[1]	The wood can be used for construction. This is a shade tree with edible fruits.[1]	Grown in Taíno guada.[2] The fruit was eaten by the Taínos and the wood used as bow. [3] The tree also was used for construction. [4] The Taínos would plant this tree in the forest garden. [5]	**Fruit**		Wood- ***bow***		Tree- *shade* , Wood- ***construction***		[1][Little & Wadsworth, 1964, p.438] [2][Keegan & Carlson, 2008, p. 79] [3] [Glogiewicz, Personal communication, March 16, 2010] [4][Benedetti, 2007] [5][Glogiewicz, Personal communication, April 14, 2010]
Mamey sapote *Pouteria sapota*		Fruit can be eaten fresh or made into jam or sherbet. The seeds can be processed into edible oil. The oil could be used for soap and has been helps to correct the colors on gourds and other crafts. The oil can also be made into skin ointment.		Fruit, seed oil	Seed oil	Seed oil- *for correcting painted arts, soap*				[Morton, 1987, p.398-402]
Saman *Pithecellobium saman*	Flowers from spring to fall, fruits from fall to winter.	Pods can be eaten or feed to animals. This is a shade tree as well as a honey plant. The tree can be used for furniture.		Pod				Tree-*shade* , Wood-*furniture*		[Little & Wadsworth, 1964, p.164]
Guamá *Inga laurina*	Flowering and Fruiting throughout the year.	The pulp in the pod is edible. This tree was used as coffee shade. The wood has been used for fuel, furniture, heavy and general construction.		Pulp		Tree- *coffee shade*		Wood- *furniture, general and heavy construction*		[Little & Wadsworth, 1964, p.150]
Mango *Mangifera indica*	Flowers mainly in the winter and spring. Fruits from May to September.	Fruit can be eaten fresh or made into preserves or juice. This is a shade tree as well as a honey plant. The seeds, flowers, bark, leaves, and resin are used for medicine. A yellow dye can be made from the bark and the leaves.		Fruit	Bark, flower, leaf, resin, seed		Bark, leaves -*yellow dye*	Tree -*shade*		[Little & Wadsworth, 1964, p.288]
Mamey[3] *Mammea americana*	Flowers from May to October. Fruits during most of the year.[1]	Fruits are preserved or eaten fresh. Insecticides can be made from the sap from the bark and the powdered seeds. Leaves can protect tobacco from insects when used as a container liner for the seedlings. Seeds are toxic to fish and chicks. [1]	Fruits of this tree were eaten by the Tainos.[2] The Taínos would keep this tree in the conuco when they clear the field for other crops. [3]	**Fruit**	Sap, seed powder, leaf -*insecticide*	Seed-*hunting poison*				[1][Little & Wadsworth, 1964, p.354] [2][Glogiewicz, Personal communication, March 16, 2010] [3][Glogiewicz, Personal communication, April 14, 2010]

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** Specific Taíno usage in light green*										
Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Fruit Orchard										
Tamarindo *Tamarindus indica*	Flowers from spring to fall. Fruits from winter to spring.	The pods can be eaten fresh or used in cooking. Additionally they can be made into candies or beverages. The pulp of the fruit is produced into laxatives for home remedies. The leaves can be processed into yellow dyes. This honey plant can also be used as fuel.		Pod	Fruit pulp	Wood-*fuel*	Leaf -*yellow dyes*			[Little & Wadsworth, 1964, p.186]
Jackfruit *Artocarpus heterophyllus*	Fruits nearly all year.	Fruits can be eaten ripe or cooked. This is a shade tree.		Fruit				Tree- *shade*		[Little & Wadsworth, 1964, p.62]
Guama Venezolano *Inga quaternata*	Flowers and fruits irregularly throughout the year, with flowers collected in July and August.	Tree is used as coffee shade and fuel. Thin pulp inside the pod is edible.		Pulp		Wood -*fuel,* Tree - *shade for coffee*				[Little & Wadsworth, 1964, p.152]
Manzana malaya *Eugenia malaccensis*	Flowers and fruits throughout the year.	Fruit can be eaten fresh, cooked, or made into wine.		Fruit						[Little & Wadsworth, 1964, p.404]
Lime *Citrus aurantifolia*	Flowers in spring to July. Fruits mature in summer and fall.	Fruits are used for drinks or as seasoning. The leaves can be prepared to make tea.		Fruit, leaf- *tea*						[Little & Wadsworth, 1964, p.218]
Pomegranate *Punica granatum*	Fruits takes 6-7 months after flowering to ripen and cannot ripen off tree. The fruit is harvested in the fall.	Fruits can be eaten fresh or pressed for juices. The juice can be made into syrup for cooking or fermented into wine. The tree helps in the tanning process. The wood can also be used in crafts.		Fruit		Tree-*tanning* , Wood-*craft*				[Morton, 1987, pp.352-355]
Bay-rum-tree, Malagueta **Ausú** [1] *Pimenta racemosa*	Flowers mainly in spring and summer. Fruits in late summer and fall.[2]	The leaves and twigs can be distilled into myrcia oil or bay oil that is used for bay rum and medicine. The wood can be used as fuel.[2]		Leaf, twig- *oil*	Leaf, twig- *oil*	Wood- *fuel*				[1][Aquino, 1977, p.58] [2][Little & Wadsworth, 1964, p.414]

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Fruit Orchard										
Nance *Byrsonima crassifolia*	Flowers and fruits from spring to fall.	Fruit can be eaten fresh, cooked, or made into a drink. The fruit can also be fed to animals. Fruit rinds can produce a light brown dye for cotton products. Bark can be used for tanning and home medicines. This is a honey plant.		Fruit	Bark	Bark -*tanning*	Rind - *light brown dye*			[Little & Wadsworth, 1964, p.258]
Hicaco[1] *Chrysobalanus icaco*	Flowers and fruits from spring to fall.[2]	Used for light construction and general carpentry. This is a honey plant.[2]	Iguanas often eat the fruit of this plant.[3]	Fruit- **iguana *hunting***		Wood- *general carpentry*		Wood- *light construction*		[1] [Aquino, 1977] [2][Little, Wadsworth & Woodbury, 1974, p.230] [3][Keegan & Carlson, 2008, p. 79]
Corázon **Mamón**[1] *Annona reticulata*	Flowers from June to September. Fruits from September to April.[2]	The fruit is eaten raw. The pulp can be utilized in home medicine. Powdered seeds are used to kill lice. The leaves and branches can produce blue or black dyes for tanning.[2]	Fruit eaten by Taínos, while the seeds are used for medicine. The Taínos also utilized the bark in rope making.[3] The Taínos would plant this tree in the forest garden. [4]	**Fruit**	Pulp, Seed powder - *insecticide* , **Seed**	Leaf, branch- *blue/black dye for tanning,* Bark- ***rope***				[1][Aquino, 1977, p.323] [2][Little & Wadsworth, 1964, p.102] [3][Glogiewicz, Personal communication, March 16, 2010] [4][Glogiewicz, Personal communication, April 14, 2010]
Pomerroso de río *Eugenia jambos*	Flowers and fruits throughout the year, although infrequently in the summer.	The wood can be used as fuel. The fruit is made into jellies, preserves, and salads. The seeds and roots can be used in home remedies. This is also a honey plant.		Fruit	Root, seed	Wood-*fuel*				[Little & Wadsworth, 1964, p.402]
Cinnamon *Cinnamomum verum*		Berries are consumed by birds. Bark is processed into cinnamon.		Bark, Berry- *hunting birds*						[Tropical Biology Association, 2006]
Calambreña **Guarapo**[1] *Coccoloba venosa*	Flowers from May to September. Fruits in October.[2]	Fruit is edible.[2]		Fruit						[1][Glogiewicz, Personal communication, April 26, 2010] [2][Little & Wadsworth, 1964, p.84]
Wax apple *Syzygium samarangense*		Fruit can be eaten raw or cooked. In Andaman and Nicobar Islands, the wood is used to construct huts. In Taiwan, the flower is used to for fever and diarrhea.		Fruit	Flower			Wood- *huts making*		[Morton, 1987, pp.381-382]

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Timbers										
Tortugo Amarillo *Sideroxylon foetidissimum*	Flowers and fruits at different times during the year, but not continuously.	The wood is good for construction, and has been used for boat building and furniture.				Wood -*boat*		Wood- *construction, furniture*		[Little & Wadsworth, 1964, p.454]
Capá blanco **Capá**[2] *Petitia domingensis*	Flowers and fruits throughout the year.[1]	This tree can be used for furniture, light and heavy construction, and bridges. [1]	The Taínos rubbed together two pieces of this wood together to make guatú (fire). [2]			Wood - *bridges,* ***fire maker***		Wood- *light/heavy construction, furniture*		[1][Little & Wadsworth, 1964, p.482] [2][Glogiewicz, Personal communication, March 16, 2010]
Moca *Andira inermis*	Flowers in winter and summer. Fruits from summer to December.[1]	Used to make furniture and poles.[1]	Fiber of the leaves and flowers were used for rope.[2]			Flower, leaf- ***rope***		Wood- *furniture, poles*		[1][Little & Wadsworth, 1964, p.188] [2] [Benedetti, 2007]
Laurel espada *Ocotea floribunda*	Flowers from October to December. Fruits mature from February to July.	Used as posts and fuel, and occasionally as lumber.				Wood- *fuel, post*		Wood		[Little & Wadsworth, 1964, p.120]
Capá prieto *Cordia alliodora*	Flowers and fruits irregularly throughout the year.	The wood is used for furniture and general construction, such as flooring and boat parts. The seeds and leaves are utilized in home medicine.			Leaf, seed	wood- *boat*		Wood- *general construction, furniture*		[Little & Wadsworth, 1964, p.468]
Guaraguao[1] *Guarea trichilioides*	Flowers and fruits throughout most of the year.[2]	Fine furniture is made from this wood but could be used for construction or carpentry. Home remedies are produced from the leaves and roots.[2]	The Taínos would keep this tree in the conuco when they clear the field for other crops.[3]		Leaf, root	Wood- *carpentry*		Wood- *construction, furniture*		[1] [Aquino, 1977, p.218] [2][Little & Wadsworth, 1964, p.244] [3][Glogiewicz, Personal communication, April 14, 2010]
Roble blanco **Apamate**[1] *Tabebuia heterophylla*	Flowers mostly in spring but could also flower throughout the year. Fruits mature throughout the year.[2]	This tree is used mostly as timber for posts and poles but could also be sued for furniture, and boat building. This is a honey plant. This tree has been used for ornamental purpose as well as for shade.[2]	The Taínos would keep this tree in the conuco when they clear the field for other crops.[1]			Wood- *post, boat building*		Wood- *furniture, pole, shade*		[1][Glogiewicz, Personal communication, April 14, 2010][2][Little & Wadsworth, 1964, p.498]

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Timbers										
Cedro hembra **Caobana**[3] *Cedrela odorata*	Flowers from June to August. Fruits mature in fall and winter.[1]	Used in general construction and carpentry.[1]	The wood was used for construction.[2] The Taínos would keep this tree in the conuco when they clear the field for other crops.[3]			Wood- *carpentry*		Wood- *general* ***construction***		[1][Little & Wadsworth, 1964, p.242] [2][Benedetti, 2007] [3][Glogiewicz, Personal communication, April 14, 2010]
Granadillo *Buchenavia capitata*	Flowers in winter and spring. Fruits throughout the year.	Occasionally used for furniture and construction.						Wood- *construction, furniture*		[Little & Wadsworth, 1964, p.386]
Algarrobo **Guamá**[3] *Hymenaea courbaril*	Flowers from early spring to fall. Pods remain on the tree for some time after they have matured.[1]	This tree is a honey plant. The wood has been used for furniture.[1]	The long strip of bark can be tied, sealed with resin, and secured with wood framework into a canoe. The bark has also been used for medicinal purpose.[1] The fruits were eaten while the resin was used as incents. The resin is helps to treat asthma by burning it and inhaling the smoke. The seed of this tree is used in a game where one person has to smack the seed of the opponent.[2] The Taínos would keep this tree in the conuco when they clear the field for other crops.[3]	**Fruit**	Bark, resin	Bark- ***canoe,*** Resin- ***incents,*** Seed- ***toy***		Wood- *furniture*	 	[1][Little & Wadsworth, 1964, p.178] [2][Benedetti, 2007] [3][Glogiewicz, Personal communication, April 14, 2010]
Guasábara *Eugenia aeruginea*	Flowers and fruits throughout most of the year.	Used for posts, fuel, and shade.				Wood- *fuel, post*		Tree- *shade*		[Little & Wadsworth, 1964, p.400]
Palma real **Yagua**[1] *Roystonea borinquena*	Flowers and fruits throughout the year.[2]	Boards from hard outer part of trunks are made into siding and flooring in rural construction. Leaves used in construction as well.[2]	Leaves were utilized for roofing, while the sheath of the leaves was used for walls. The roof was also made of thatch. Slabs of palm wood can also be utilized for construction.[3] This tree can be made into cuisa, or a small shovel that was used to stir the cassava bread. Pouches, twine, and macana (club) were also made from this tree.[4] The Taínos would keep this tree in the conuco when they clear the field for other crops.[5]			Trunk- ***shovel, pouch, twine, macana***		Leaf, Trunk- ***construction, hut building***		[1][Aquino, 1977, p.418] [2][Little & Wadsworth, 1964, p.44] [3][Fewkes, 1907, pp.44-45] [4] [Glogiewicz, Personal communication, March 16, 2010] [5][Glogiewicz, Personal communication, April 14, 2010]

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Timbers										
Moralón *Coccoloba pubescens*		Heavy wood often used in construction and furniture.						Wood- *construction, furniture*	 	[Little & Wadsworth, 1964, p.78]
úcar *Bucida buceras*	Flowers and fruits irregularly throughout the year.	Timber used in heavy exterior construction, flooring, and benches. Bark was used in tanning.				Bark -*tanning*		Wood- *exterior construction, furniture*		[Little & Wadsworth, 1964, p.388]
Trumpet-tree **Yagrumo**[1] *Cecropia peltata*	Flowers and fruits throughout the year.[2]	Used in interior construction. Hollow stems made into gutters and water troughs.[2]	The Taínos would keep this tree in the conuco when they clear the field for other crops.[3]					Wood- *interior construction* , Stem- *gutter/ trough*		[1][Aquino, 1977, p.417] [2][Little & Wadsworth, 1964, p.66][3][Glogiewicz, Personal communication, April 14, 2010]
Mameyuelo *Ardisia obovata*	Flowers and fruits throughout the year.	Used for posts.				Wood- *post*				[Little & Wadsworth, 1964, p.430]
María[3] *Calophyllum brasiliense*	Flowers in spring and summer. Fruits mainly in the fall.[1]	Used for construction, furniture, handles, and tools. Medicine can be made out of the latex from the trunk.[1]	Sap was used by the Taínos for medicine. [2] The Taínos would keep this tree in the conuco when they clear the field for other crops.[3]		**Sap**	Wood- *handle, tool*		Wood- *construction, furniture*		[1][Little & Wadsworth, 1964, p.348] [2][Glogiewicz, Personal communication, March 16, 2010] [3][Glogiewicz, Personal communication, April 14, 2010]
Uvillo *Coccoloba diversifolia*	Flowers and fruits throughout most of the year.	Used for posts and poles.				Wood- *post*		Wood- *pole*		[Little & Wadsworth, 1964, p.76]
Higüero[3] *Crescentia cujete*	Flowers and fruit throughout the year.[1]	Wood can be used for fuel. The fruit is produced into containers, utensils, ornaments or as music instruments. The poisonous pulp of the fruit is utilized in medicine.[1]	Made into maracas for music. Also associated with water and used as a water container.[2] The fruit was also made into cups and dishes by the Taínos.[3]		Pulp	Fruit- ***container, craft, music instruments*** , Wood- *fuel*			 	[1][Little & Wadsworth, 1964, p.490] [2][Keegan & Carlson, 2008, p.91] [3][Glogiewicz, Personal communication, March 16, 2010]
Maga[3] *Montezuma speciosissima*	Flowering and fruiting throughout the year.[1]	Used for furniture, musical instruments, posts, and poles. [1]	The Taínos rubbed the wood together to make guatú (fire). [2]			Wood- *musical instruments, post,* ***fire maker***		Wood- *furniture, pole*	 	[1][Little & Wadsworth, 1964, p.328] [2][Glogiewicz, Personal communication, March 16, 2010]

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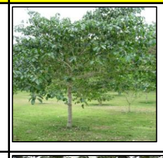
Timbers										
Corozo, prickly palm **Aovara**[2] *Acrocomia media*	Flowers and fruits throughout most of the year.[1]	The seeds are edible and can be made into rings. The fruits are called guanabina.[1]	The Taínos called the fruit guanabina and used it for food. Additionally, the fruit was utilized for medicinal purposes. A colisibi, or a necklace, can be made by interspersing the seeds with small stones.[2]	**Fruit**	**Fruit**		Seeds- *rings,* ***necklaces***			[1][Little & Wadsworth, 1964, p.34] [2][Glogiewicz, Personal communication, March 16, 2010]
Espino rubial *Zanthoxylum martinicense*	Flowers and fruits from spring to fall.	Used in light carpentry, for boxes or in low grade furniture.				Wood- *box, light carpentry*		Wood- *furniture*		[Little & Wadsworth, 1964, p.230]
Retama *Lonchocarpus latifolius*	Flowers from March to June, fruits nearly throughout the year.	Used as fuel. Roots and fruits have insecticidal properties.			Root, fruit- *insecticide*	Wood- *fuel,*				[Little & Wadsworth, 1964, pp.198, 199]
Ortegón **Soco**[1] Coccoloba swartzii	Flowers and fruits from June to September.[2]	Made into posts.[2]				Wood- *post*				[1][Glogiewicz, Personal communication, April 26, 2010] [2][Little & Wadsworth, 1964, p.80]
Trail										
Jagüey colorado *Ficus sintenisii*	Fruits throughout the year.	Used for fuel and posts.				Wood- *fuel*		Wood- *post*		[Little & Wadsworth, 1964, p.74]
Guácima[3] *Guazuma ulmifolia*	Flowers from spring to fall. Fruits throughout the year.[1]	Used in general carpentry, interior construction, and as charcoal. Immature fruits are eaten by animals but can also be eaten fresh or cooked by humans. Made into a beverage by crushing the fruit and soaking in water. Bark can be used for rope or twine. Various parts of the tree have medicinal prosperities. This is a honey plant. [1]	The wood was used in construction.[2] The Taínos would keep this tree in the conuco when they clear the field for other crops. [3]	Fruit	Various parts	Wood- *carpentry charcoal* , Bark- *rope, twine*		Wood- ***construction***	 	[1][Little & Wadsworth, 1964, p.338] [2] [Benedetti, 2007] [3][Glogiewicz, Personal communication, April 14, 2010]
Caimitillo *Micropholis chrysophylloides*	Flowers and fruits throughout the year.	Used for construction and general carpentry.				Wood- *general carpentry*		Wood- *construction*		[Little & Wadsworth, 1964, p.448]

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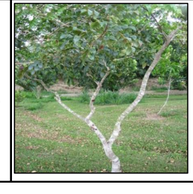
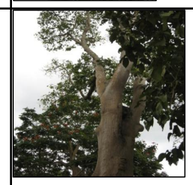
Trail										
Palo de cruz *Rheedia portoricensis*	Flowers and fruits at different times during the year.	Made into posts.				Wood- *post*				[Little & Wadsworth, 1964, p.356]
Péndula *Citharexylum fruticosum*	Flowers and fruits throughout the year.	Used wood for furniture, construction and musical instruments.				Wood- *musical instruments*		Wood- *construction, furniture*		[Little & Wadsworth, 1964, p.480]
Cupey[3] *Clusia rosea*	Flowers and fruits throughout the year.1	Used wood mainly for fuel and construction. The latex from the bark, fruit, and other parts help to seal boats and can be made into medicine. Leaves can be produced into a substitute for playing cards.[1]	As a source of resin, leaves can be made into a paper substitute.[2] The gummy sap was used by the Taínos for medicinal usage as well as for a batos (ball). [3]		Sap	Sap- *seal boat* , **ball,** Wood- *fuel*		Wood- *construction*		[1][Little & Wadsworth, 1964, p.352] [2][Keegan & Carlson, 2008, p.80] [3] [Glogiewicz, Personal communication, March 16, 2010]
Elephant grass *Pennisetum purpureum*		Used mostly for animal feed. The leaf and stalk has been produced into a diuretic for anuria and oliguria. Also has been made into a medicinal salt.		Leaf -*animal feed*	Leaf, stalk					[Duke, 1983c]
Cóbana negra *Stahlia monosperma*	Flowers in spring and early summer. Fruits in summer and fall.	Used wood for furniture and construction. Medicine can be made from it's bitter bark. This is a shade tree.						Wood- *construction, furniture*		[Little & Wadsworth, 1964, p.184]
Button-mangrove **Yana**[1] *Conocarpus erectus*	Flowers and fruits throughout the year.[2]	Used bark in tanning and medicine.[2]			Bark	Bark- *tanning*				[1][Glogiewicz, Personal communication, April 26, 2010][2][Little & Wadsworth, 1964, p.390]
Cyperius papyrus		Used by the Egyptians to make paper. This plant can be invasive and should be contained when planting underwater.				Stem-*paper*				[Scheper, 2004a]
West indies mahogany *Swietenia mahagoni*	Flowers from March to July. Fruits in the winter.	Used wood for furniture and construction. Medicine is produced from it's bitter bark. This is a shade tree.			Bark			Tree- *shade,* Wood- *construction, furniture*		[Little & Wadsworth, 1964, pp.250, 252]

List of plants and usages in Caguas Botanical and Cultural Garden

* Usage that is specifically Taínos colored in light green

** Specific Taíno usage in light green*

Common names **Taíno name** *Scientific name*	Flowering Fruiting time	General use	Taíno use Jibaro use	Food*	Medicine*	Tools Crafts Small objects*	Clothing Dye Jewelry*	Shelter Construction Furniture*	Picture(s)	Reference(s)
Trail										
Tártago emético, maná **Tau tau**[3] *Jatropha multifida*	Flowers and fruits randomly.[1]	Although poisonous, the seeds and sap can be used in some remedies.[1]	Flowers were employed by the Taínos as a natural laxative. [2]		Seeds, sap				 	[1][Little et al., 1974, p.420] [2] [Allsworth-Jones, 2008, p.60] [3][Glogiewicz, Personal communication, April 26, 2010]
Astromelia *Lagerstroemia speciosa*	Flowers from May through October. Fruits from winter to summer.	Used for shade and to make small boats.				Wood- *boat*		Tree- *shade*		[Little & Wadsworth, 1964, p.382]
Fox tail palm *Wodyetia bifurcata*	Flowers and fruits throughout the year.	Boards from hard outer part of trunks used for siding and flooring in rural construction. Leaves utilized in construction as well.	Leaves and thatch were used for roofing, while sheaths of the leaves were made into walls.[3] Slabs of palm wood can also be utilized for construction.[4]					Leaf, Trunk- ***construction, hut making***		[Little et al., 1974, p. 44]
Bamboo *Bambusa vulgaris*	Bamboo flowers after years of growth to produce seeds and then dies off.	Can be used in construction, basket weaving, and furniture making. The shoots are utilized in cooking.		Shoots		Stem- *basket weaving, furniture*		Stem- *construction*	 	[Little & Wadsworth, 1964, p.32]
Mother of cocoa *Gliricidia sepium*	Flowers in the winter and spring. Fruits from winter to summer.	Used for heavy construction and in post making. Rodent poison is made from the seeds, bark, leaves, and roots. Home remedies are produced from it's crushed leaves. This is a shade tree.			Leaf	Wood- *post* , Bark, leaf, root, seed- *rodent poison*		Tree- *shade* , Wood- *heavy construction*		[Little & Wadsworth, 1964, p.196]
Moral *Cordia sulcata*	Flowers from late spring to fall. Fruits throughout the year.	Used for shade.						Tree- *shade*		[Little & Wadsworth, 1964, p.474]
Bucayo gigante *Erythrina poeppigiana*	Flowers from January to March. Fruits from February to May.	Used for coffee shade. The bark, twigs, and seeds provide drugs and medicines.			Bark, seed, twig	Tree- *coffee shade*				[Little & Wadsworth, 1964, pp.194-196]
Allamanda *Allamanda cathartica*	This is a perennial vine.									[Scheper, 1999]

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Trail										
Banana *Musa x paridasiaca*	Harvest time varies according to planting time. If planted in summer, the plant takes 14-16 months to harvest, and 17-19 months if planted in winter time.	The fruit is eaten fresh or cooked. The fruit can also be processed into flour. The green plantain can be dried, ground, and roasted as a substitute for coffee. The terminal male bud has been utilized in cooking. The new shoots of a young plant can be eaten like vegetables. The leaves of the plant can be made into different product's from cooking containers to raincoats and clothing. All parts of the plant have been used for medicinal purposes.		Fruit, new shoots of young plant, terminal male bud	All parts	Leaf- *container*	Leaf- *raincoat, clothing*		 	[Morton, 1987, pp.29-46]
Flamboyán *Delonix regia*	Flowers from May to August. Fruits throughout the year.	Used pods and wood for fuel.				Pod, wood- *fuel*				[Little & Wadsworth, 1964, p.176]
Hedychium coronarium	Flowers around late spring to summer.	Used mostly for landscaping because of the sweet scent produced by the plant.								[NTBG, 2004d]
Flamboyán amarillo *Peltophorum inerme*	Flowers from spring to fall. Fruits in the winter.	Used for fuel.				Wood- *fuel*				[Little & Wadsworth, 1964, p.182]
African tulip tree *Spathodea campanulata*	Flowers and fruits throughout the year, mainly from late winter to early summer.	Children use the unopened buds as water pistols. This is a shade tree.				Buds -*toys*		Tree- *shade*	 	[Little & Wadsworth, 1964, p.494]
Emajagüilla[1] *Thespesia populnea*	Flowers and fruits from spring to fall.[2]	Used in boatbuilding and as fuel. The bark can be made into rope. The flowers are edible, while the fruits are help to treat skin eruptions. [2]		Flower	Fruit	Bark- *rope* , Wood- *boatbuilding, fuel*				[1][Aquino, 1977, p.184] [2][Little & Wadsworth, 1964, p.330]
Reullia brittoniana	Flowers more when more sun light is available.	This is consider an invasive species. Used mostly as an ornamental plant								[Scheper, 2004b]
Violeta *Polygala cowellii*	Flowers when tree is leafless. Seeds in March and April.	Used ornamentally only.								[Little & Wadsworth, 1964, p.260]

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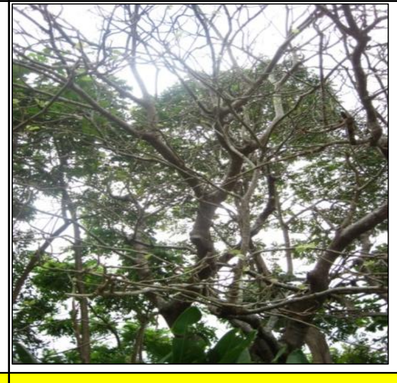
Trail										
Bauhinia monandra	Flowers and fruits throughout most of the year.	Used for fuel.				Wood- *fuel*				[Little & Wadsworth, 1964, p.168]
Bottlebrush *Callistemon*	Blooms in spring and summer.	The nectar attracts birds and insects.		Nectar-*hunting*						[Australian National Botanic Gardens, 2008]
Queen of flowers *Lagerstroemia speciosa*	Flowers from May through October. Fruits from winter to summer.	This is a shade tree which can be used to make small boats.				Wood- *boat*		Tree- *shade*		[Little & Wadsworth, 1964, p.382]
Bauhinia tomentosa	Flowers from December to March. Fruits from January to June.	The nectar attracts insects and birds. Leaves also attract certain birds and larvae.		Nectar, leaf-*hunting*						[NTBG, 2005a]
Bucayo enano *Erythrina berteroana*	Flowers from January to April. Fruits from April to May.	Wood can be used as cork substitute or for carving. The young branches and leaves are eaten by rabbits and cattle. The flower buds, young leaves and young twigs can be cooked and eaten but may be harmful to health. Ornaments or crafts can be made from the seeds. The branches can be used as fish poison. Yellow dye can be made from it's processed bark. This is a shade tree.		Branches, leaf-*animal feed,* Flower buds, young leaf, young twigs- *food*		Branch- *fish poison, Seed- craft,* Wood-*carving*	Bark- *yellow dye,* Seed- *ornament*	Tree- *shade*		[Little & Wadsworth, 1964, p.192]
Past First Petroglyph										
Jabilla **Jabiyo**[1] *Hura crepitans*	Flowers mainly in summer and fall. Fruits from late summer to winter.[2]	Used for furniture and construction.[2] The shell of the fruit has been used for jewelry.[3]					Shell-jewelry	Wood- *construction, furniture*	 	[1][Aquino, 1977, p.280] [2][Little & Wadsworth, 1964, p.276] [3] [Armstrong, 2008]

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Past First Petroglyph										
Mabi *Colubrina elliptica*			This tree was used to make a fermented drink. Jewelry was made from it's seeds. Medicinally, this tree can treat acne, fever, menstrual pain, liver problems and can be an antidote to fish poisoning.	Tree- ***drink***	**Tree**		Seed- ***jewelry***			[Benedetti, 2007]
Abeyuelo **Bitaran**[3] *Colubrina arborescens*	Flowers and fruits irregularly from spring to fall.[1]	Wood is used for construction and the seeds can be made into ornaments.[1]	The seeds were used by the Taínos as ornaments.[2]				Seed- ***ornaments***	Wood-*construction*	 	[1][Little & Wadsworth, 1964, p.316] [2][Glogiewicz, Personal communication, March 16, 2010] [3][Glogiewicz, Personal communication, March 16, 2010]
Yarey *Sabal causiarum*	Flowers and fruits irregularly throughout the year.[1]	Young leaves can be made into straw hats, baskets, mats, and hammocks. Additionally older leaves can be used to make thatch roofs.[1]	Leaves were used for roofing, while the sheath of the leaves were made into walls. The roof was made of thatch. Slabs of palm wood can also be used for construction.[2]			Leaf- *basket*	Leaf- *hat*	Leaf- *hammock* , *mat*, ***roof, hut making***		[1][Little & Wadsworth, 1964, p.316] [2][Fewkes, 1907, pp.44-45]
Coaba *Amyris elemifera*	Irregular flowering and fruiting throughout the year.	Wood can be made into furniture or fuel.				Wood- *fuel*		Wood- *furniture*		[Little & Wadsworth, 1964, p.216]
Cojóbana[1] *Piptadenia peregrina*	Flowers from March to June. Pods are present throughout the year.[1]	Wood was made into posts. The bark is used for tanning. The seeds can be ground to form narcotic snuff called “cojoba”, which is utilized in religious ceremonies.[1]	Cohoba, a powder from the crushed seeds of this plant, was used by the cacique and behique to communicate with the gods and spirits during various rituals. [2]		Seed- ***cojoba***	Bark- *tanning* , Wood- *post*				[1][Glogiewicz, Personal communication, March 16, 2010] [2][Little & Wadsworth, 1964, p.158] [2][Keegan & Carlson, 2008, pp. 89, 91]
Jagüey blanco **Jagüey** *Ficus laevigata*	Fruits throughout the year. [1]	Wood can be used to make guitars, fuel and in light construction.[1]	The Jibaros used the sap of this tree for asthma when placed in their coffee. Sap was also utilized by the Jibaro as an anesthesia and pain killer for muscle and joint pain. [2]		Sap	Wood- *guitar*, *fuel*		Wood- *light construction*		[1][Little & Wadsworth, 1964, p.70] [2][Benedetti, 2007]

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Conuco										
Lerén[2] *Calathea allouia*	Tuber takes 10-12 months to form.[1]	The tuber can be eaten when cooked. Leaf extract has been used as medicine. Fresh leaves can be woven into clothing.[1]	The Taínos would cultivate this plant in mounds in the conucos.[2]	Tuber	Leaf- *extract*		Leaf- *clothing*			[1][Bermejo & León, 1994, p.239-244] [2][Glogiewicz, Personal communication, April 14, 2010]
Yautia[3] *Xanthosoma sagittifolium*	Takes 9-11 months before it can be harvested.[1]	The tuber is edible and comparable to potato. Young leaves can also be eaten.[1]	The Taínos would cultivate this plant in the conuco. [2]	**Tuber,** young leaves						[1][Bermejo & León, 1994, p.253-258] [2][Keegan & Carlson, 2008, p. 72; Glogiewicz, Personal communication, April 14, 2010]
Manioc **Yuca**[3] *Manihot esculenta*	Normally harvested after 8-14 months.[1]	The sweet varieties of tuber must be peeled, then it can be eaten raw or cooked. The bitter variety must be cooked before consuming. The young leaves have been used as medicine for beriberi. The poisonous juice from the tuber can be reduced and given as medicine.[1]	Sweet variety cooked like potato. The bitter type is processed into cassava bread. Cassava bread was eaten by the Taínos and was also fed to farmed Iguanas. The root can also be made into a beer called Uicu, used during celebrations.[2] The Taínos would cultivate this plant in mounds in the conucos[3]	**Tuber**	leaf, tuber juice					[1][Duke, 1983b] [2][Keegan & Carlson, 2008, pp. 32, 74, 89] [3][Glogiewicz, Personal communication, April 14, 2010]
Papaya[4] *Carica papaya*	Flowers and fruits throughout the year.[1]	The green fruit can be cooked while the ripe fruit is eaten raw or made into desserts. This fruit can aid digestion. The various parts of the plant such as the sap, juice of the fruit, or the leaves can help tenderize meat. Leaves can be cooked like vegetables. Seeds, juice, flowers and leaves have been used as home remedies.[1]	Grown in Taíno guada.[2] Fruit was eaten by Taínos, while the leaves and trunk were employed for medicinal usage.[3]	**Fruit**, leaf- *tea*	Flower, juice, **leaf,** seed, **trunk**	Fruit, juice, leaf, sap- *tenderize meat*				[1][Little & Wadsworth, 1964, p.374] [2][Keegan & Carlson, 2008, p. 79] [3][Glogiewicz, Personal communication, March 16, 2010] [4][Glogiewicz, Personal communication, April 14, 2010]

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Past Conuco										
Jagua [4] *Genipa americana*	Flowers and fruits from spring to fall.[1]	Used the wood for furniture, tools, interior construction, and shipbuilding. The fruit is edible and the fermented juice can be made into a beverage. The unripe fruit can be processed into blue-black dye, which can be used in tattooing and painting the body to keep away bugs. This is a honey plant as well as a shade tree.[1]	Fruits can be processed into black dye for paint, tattoo, and hair dye.[2] As a result, the black dye protects the user from insect bites. The Taínos turned the fruit of this tree into a drink, while the wood was used to make bows.[3] The Taínos would plant this tree in the forest garden.[4]	Fruit- *eaten*, ***drink***	Dye- **repel insects**	Wood- **bow,** *tools*	Fruit- ***blue-black dye***	Tree- *shade* , Wood- *interior construction, furniture*		[1][Little & Wadsworth, 1964, p.70] [2][Keegan & Carlson, 2008, p. 80] [3][Glogiewicz, Personal communication, March 16, 2010] [4][Glogiewicz, Personal communication, April 14, 2010]
Achiote **Bija**[4] *Bixa orellana*	Flowers mainly in spring. Fruits mainly in summer.[1]	Fruit can be used to get an orange-red dye called anatto. Anatto is used to color rice, margarine, butter, cheese, and soups. Indians painted their bodies, to relieve themselves of insects.[1]	The inside of the fruit can be made into a red dye which the Taínos called Bija for body paint and to repel mosquito. Associated with male virility.[2] Leaves and seeds were used by the Taínos for medicine and to dye clothing. [3] The Taínos would plant this tree in the forest garden. [4]	Fruit- *food coloring*	Leaf, Seed- ***medicine,*** Dye- ***repel insects***		Leaf, seed- ***orange-red dye***		 	[1][Little & Wadsworth, 1964, p.358] [2][Keegan & Carlson, 2008, p. 79] [3][Glogiewicz, Personal communication, March 16, 2010] [4] [Glogiewicz, Personal communication, April 14, 2010]
Camasey[1] *Miconia prasina*	Flowers and fruits throughout most of the year.[2]	Wood can be used for fuel.[2]	The fruit of this tree was made into a medicinal concoction. The fruit is often used to treat diarrhea, hemorrhages, and ulcers. The dry leaves were grounded for treating open wounds. [3] The Taínos would keep this tree in the conuco when they clear the field for other crops. [4]		**Dry leaf, fruit**	Wood- *fuel*				[1][Aquino, 1977] [2][Little & Wadsworth, 1964, p.422] [3][Benedetti, 2007] [4] [Glogiewicz, Personal communication, April 14, 2010]

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Past Conuco										
Uva de playa **Guiabara**[1] *Coccoloba uvifera*	Flowers and fruits throughout the year.[2]	The wood can be made into furniture and posts, while the bark can be used for tanning. Medicine can be made from astringent roots and bark. The fruits are edible and are made into jellies or fermented beverages. The leaves can be used as a paper substitute. [2]	The edible fruit was eaten by the Taínos and fermented into a drink. The drink was used to treat hemorrhages and malaria. [3]	Fruit- ***eaten, drink***	Bark, root, Fruit- ***drink***	Bark -*tanning,* Leaf- *paper* , Wood- *post*		Wood- *furniture*		[1][Aquino, 1977, p.240] [2][Little & Wadsworth, 1964, p.82] [3][Benedetti, 2007]
Guara[4] *Cupania americana*	Flowers in winter and early spring. Fruits in spring and summer.[1]	Used for poles and posts in construction and shipbuilding. The seeds and leaves are used in medicine.[1]	The leaves and seeds were utilized by the Taínos for medicine. [2] Diarrhea was treated using the bark of the tree. The leaves helped heal gallbladder stone inflammation, and a broth of the leaves was utilized for treating sprains. [3] The Taínos would keep this tree in the conuco when they clear the field for other crops. [4]		**Bark, leaf, seed**	Wood- *post, shipbuilding*		Wood- *construction, pole*	 	[1][Little & Wadsworth, 1964, p.302] [2][Glogiewicz, Personal communication, March 16, 2010] [3][Benedetti, 2007] [4][Glogiewicz, Personal communication, April 14, 2010]
Guayacán[1] *Guaiacum officinale*	Flowers and fruits from spring to fall.[2]	The wood is naturally lubricated so it is ideal for making mechanical joints where lubrication is needed to reduce friction. The resin extracted from the bark and sapwood can be used as medicine. This tree can be planted as an ornamental plant because of its slow growth. [2]	This tree was used by the Taínos to make cemi and duhos(stools). The seed was utilized for ceremonies and the sap helped to treat syphilis. The Jibaros would use the resin for respiratory diseases. Throat infection, bruises, skin fungus, and tooth ache were treated with a mixture of resin and rum. The leaves on the other hand, were used to treat colds, asthma and diabetes. [3]		Resin, **sap,** resin, leaf	Wood- *mechanical joints,* ***cemi, stool***				[1][Aquino, 1977, p.229] [2][Little & Wadsworth, 1964, p.212] [3][Benedetti, 2007]
Almácigo **Carana**[3] *Bursera simaruba*	Flowers and fruits in spring and summer.[1]	The wood can be used for light construction. The Chibou, Cachibou, or Gomart resin from this tree can be utilized in home medicines, glues, and the coating for canoes. Tea can be made from the leaves.[1]	Taínos used the tree's branches for torches . The tea that was made from the leaves was served with salt to treat anemia and other general diseases. The resin was used as a fungicide, antiseptic, and diuretic. [2]	Leaf- *tea*	**Resin, Leaf**	Resin- *canoe coating,* Branch- ***torch***		Wood- *light construction*		[1][Little & Wadsworth, 1964, p.236] [2][Benedetti, 2007] [3][Glogiewicz, Personal communication, April 14, 2010]

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Past Conuco										
Guasábara *Eugenia aeruginea*	Flowers and fruits throughout the year.	The tree can be made into posts and fuel while the tree provides shade for other trees.				Wood- *fuel, post*		Tree- *shade*		[Little & Wadsworth, 1964, p.400]
Chambibe *Sapindus saponaria*		The wood can be used for posts and carpentry while, soap is made from the fruits of the tree. The crushed seeds are utilized as a fish poison, while ground seeds can make an insecticide. Jewelry can be made from seeds. Roots, leaves, and oils extracted from the seeds are used in home remedies.[1]	The fruit is well known for its use as a soap. In medicine, this tree can treat asthma, while the oil of the seed helped treat skin inflammation, arthritis, and candles. The seeds were utilized by the Taínos to tranquilize the fish so they were easier to catch. The seeds were also mashed to produce insecticide.[2]		Leaf, root, **seed oil,** Seed- ***insecticide,***	Fruit- ***soap*** **,** Seed- ***fish tranquilizer*** **,** Wood- *carpentry, post*	Seed- jewelry			[1][Little & Wadsworth, 1964, p.308] [2][Benedetti, 2007]
Algodon, cotton **Sarobei**[1] *Gossypium hirsutum*	Flowers 80-110 days after planting. Takes another 55-80 days before harvesting the cotton.[2]	Cotton is harvest for various textile products. The seeds can be processed for edible oil. The cottonseeds can be made into edible baked goods. Cottonseeds and roots has been used in home medicines.[2]	Cotton was used by the Taínos to make belts and naguas, an status apron for women. [3] For men, the cotton was used to make breechcloth for the Cacique. [4] Hammocks, nets, rope, and blankets were also produced from cotton. The seeds were eaten by the Taínos. In medicinal usage, the leaves were boiled to treat skin irritation, high body temperature, and respiratory problems. The roots were used as an contraceptive and during child birth and hemorraging.[5] The Taínos would plant this tree in the home garden.[6]	**Seed,** seed oil	**Leaf, root**, seed	Cotton- ***net, rope***	Cotton- ***belts, naguas, breechcloth***	Cotton- ***hammock, blanket***	   	[1][Aquino, 1977, p.380] [2][Duke, 1983a] [3][Keegan & Carlson, 2008, p.68] [4][Fewkes, 1977, p.213] [5][Benedetti, 2007] [6][Glogiewicz, Personal communication, April 14, 2010]
Bulletwood **Ausubo**[1] *Manilkara bidentata*	Flowering and fruiting irregularly throughout the year.[2]	The fruit is edible. The wood is strong and is used commercially for heavy construction, bridges, violin bows, and many other products. Balata gum is made from the milky sap of the tree.[2]	The Taínos would keep this tree in the conuco when they clear the field for other crops.[1] Sap could have been used to make the batey ball.[3]	Fruit		Sap- ***ball*** **,** *balata gum*		Wood- *bridge, heavy construction,*		[1][Glogiewicz, Personal communication, April 14, 2010] [2][Little & Wadsworth, 1964, p.358] [3][Goyco, 2004, p.3]

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Past Conuco										
Maguey Furcraea tuberosa			The fiber of this tree was used by the Taínos for making hammocks and basket plaiting.			Fiber- *basket*		Fiber- *hammock*		[Fewkes, 1907, p.213; Benedetti, 2007]
Pineapple **Ananá**[3] *Ananas comosus*	Fruit appears 21-48 months after planting. The fruit of the 'Red Spanish' variety is mature enough for shipping 150 days after flower blooms.[2]	Ripen fruit can be eaten fresh or cooked . An old practice involves soaking the pineapple slices in salted water before eating it. The fruit is also juiced. The juice can be made into vinegar, helping the fermentation of molasses into alcohol. It could also be used for cleaning knifes or scrubbing boat decks with sand. The juice of the mature stem can yield an enzyme called bromelain which will help tenderize meat and reduce swellings. The young shoots can be eaten. The terminal bud and the inflorescences can be eaten fresh or cooked. The leaves can also be used for weaving because the leaves provide strong fibers. Medicinally, the juice, flesh of very young fruits, roots, leaves juice, and crushed rind can be used.[2]	The Taínos would plant this plant in the forest garden.[3]	Fruit, young shoot, terminal bud	Fruit juice, very young fruit, leaf juice, rind	Fruit juice- *cleaning knife, scrubbing deck, tenderize meat*	Leaf- *weaving*		 	[1][Aquino, 1977, p.428] [2][Morton, 1987, pp.18-28] [3][Glogiewicz, Personal communication, April 14, 2010]

PETROGLYPH INTERPRETATION

This petroglyph was rescued from an illegal sale and was taken to the Caguas Botanical and Cultural Garden for preservation and interpretation. This particular petroglyph is thousands of years old, showing the story of a specific *Cacíques* lineage. The left side of the stone shows the mother's lineage. The women were always indicated on the left side. The female's side is displayed more in depth because, unlike many other cultures, the social ranking was passed down from the maternal line. In marriage the man moved to the woman's house to live with her family. However, he still retained his status as head of the household. The right side of the stone indicates the paternal lineage. The position of the *Cacique* was inherited by the sister of the *Cacique's* oldest child. The majority of the *Cacíques* were male but they could also be female if there was no male heir.

As seen on this particular petroglyph, status was often indicated by symbols. Crowns specifically were seen to indicate status in society. Gender could also be determined by these symbols. Rays facing downward depict males, while legs indicate females. The upper part of the petroglyph shows a lineage from the famous four sons of Itiba Cahubaba. It is possible that this individual was part of the tortoise clan because the tortoise was born from the back of the oldest brother, Deminán Caracaracol.

CAGUAS BOTANICAL AND CULTURAL GARDEN

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Back to Our Forest Roots Trail System

CAGUAS BOTANICAL AND CULTURAL GARDEN

Caguas, Puerto Rico

MURAL

The Taínos were a part of nature as much as nature was a part of them. This mural shows such a relationship. The Taínos believed that common roots between themselves and the natural world existed. The woman painted here is assembled from the mountains and the river, showing how she is connected to nature.

Bordering this mural are replicates of petroglyphs. Petroglyphs are stone carvings used by the Taínos to communicate with the spirits. The shaman heard messages from the rocks through the use of *cohoba*. The shaman would then convey these messages to artisans who would carve these images into the rocks. These carvings were usually done by the side of the river, so that the messages could be reflected into the water and seen by the dead. Petroglyphs can also be seen as decorations symbolizing different legends, lineages, and stories.

GLOSSARY OF TAINO WORDS USED IN INTERPRETIVE STORIES

Batos- rubber ball
Batey- a game involving a rubber ball and 20-30 people
Behique -priest
Cacique- chief
Cemi- God or object that represents the god
Cohoba- A snuff made of ground cojóbana seeds
Collisibi- a necklace made of small stones and corozo seeds
Conucos- fields where crops are planted
Guadua- house garden
Naguas- apron worn by the married women
Opia- spirits of the dead

FRUIT ORCHARD

A. Guava- You sit on a low branch of a guava tree and you bite into the sweet insides of its fruit. You enjoy the guava tree and are glad that it grows so close to home, in the *guada*. Your parents warn you about the spirits or *Opia* that feed from the Guava tree at night. The juice runs down your chin just as your father approaches the tree. He cries "*Opia*" as he pulls you from the branch. You giggle and point to your belly button to show him that you are not a spirit, but his daughter.

B. Cashew- You walk through the *conucos*, the ripe yellow and red Cashew apples catch your eye. You sit under the tree and eat the Cashew apples from the low branches and save the nuts for your mother. In a basket made from the leaves of the Maguey plant, you decide to bring back some fruits to the village. You can't wait to get home to roast the nuts with your mother.

C. Guanábana- Imagine you are a Taíno girl, you like the Guanábana tree that stands in the *guada*. When your mother gives the tree extra care, the fruit grows larger than your head! You are too scared to sit under this tree because the spiky fruit looks like the puffer fish that the fishermen bring to the *Behique* for his ceremonies. But as the fruit ripens, the spikes curl up and disappear, and you are not afraid to touch it.

Your mother opens up the fruit so the family can enjoy the tasty white insides. She tells you that the leaves are poisonous and to stay away from them, just like you stay away from the puffer fish. Sometimes you see your mother rub the leaves into your brother's scalp to kill off the itchy lice. You hope that your mother does not have to do the same for you!

D. Avocado- You watch the Avocado tree produce buttery fruit year after year. Your mother uses the creamy flesh just under the tough skin, and gets rid of the pit. You and your friends collect these pits. You grind the seeds on a rough rock, coloring your palms red. Do you like getting red dye all over your hands? You run to your mother and rub your hands on her *naguas.* You laugh as you see the new hand prints all over her beautiful *naguas*.

E. Caimito- You try to grab the Caimito fruit for your mother, but cannot reach the high fruit. You grab the branch and bend it closer, thinking that this branch would make a very good bow. You know that you should never cut the branches from the trees in the *guada.* These trees produce fruit for the village. You decide to go further into the forest where your mother won't gather fruit. You then cut down a few branches from the tree for a new bow.

F. Mamey- You are glad the Mamey fruit is usually left for the *Opia* because it is one of the hardest fruits for you and your mom to prepare. The skin is thick and hard to cut. However, when you finally get to the fruit it is a juicy, bright orange color like a papaya. Can you taste it?

G. Hicaco and Corázon- If you were a Taíno boy, what would you do in your free time? Would you enjoy going to the Hicaco tree? There you find lots of iguanas happily enjoying the fruit. You watch them run around, and sometimes even try to catch them. Your dad teaches you how to catch them as they run by. He makes a rope for you from the bark of the Corázon tree to tie the legs of the iguanas that you catch. Maybe one day you will be a hunter for your village!

H. Calambreña- The fruit of the Calambreña tree reminds you of your mother's jewelry. Today you decide to dress up. You pick a whole string of fruit from the tree and tie them loosely around your neck. You feel very beautiful dressed up like your mother.

MANAGED FOREST

I. Roble Blanco- You go deep into the woods with your father to cut down a Roble Blanco tree. He teaches you how to create small boats from the trunk. Once you and your father finish the boat, the men of the village will use it for fishing trips.

J. Algarrobo- You help your father strip a long piece of bark from the Algarrobo tree. Your father then bends the bark around wooden sticks to help form a canoe. This is one of your favorite ways of making canoes because it is made of just bark!

K. Palma Real- The roof of your hut is old and leaky. You go to the Palma Real with some older boys to gather new palm branches to fix the leaks. Each time you go further into the forest so you don't hurt the palms by taking all their branches. Once you return, your dad cuts the leaves off of the branches to fix the roof. When he finishes, he uses the branches to make *macana*.

L. Higüero- Your favorite chore is to help your parents pick the gourds from the Higüero tree. The gourds grow in all sizes. Can you imagine what kind of things you can make from these gourds? Your father makes containers from these gourds by cutting them open and removing the seeds. You help him dry the gourds by placing them in the sun .

M. Corozo– Today, you compete with your friends to see who collects the most seeds from the ground around the Corozo trees. You crawl under the smaller trees, because you know that the other girls are afraid of the spiny stems and leaves. You easily win the competition! You proudly walk home with a basket full of Corozo seeds so your mother can make a *colisibi*.

PRE-GARDEN

N. Jabiyo- This is the first time you see the Jabiyo tree with ripe fruit! You reach toward the fruit with excitement. But suddenly, the fruit explodes! The sections of the fruit split off, and you see many flat brown seeds. You jump back in terror and grab hold of your mother's *naguas.* You learn to stay far away from this tree so you do not get hit by the seeds again!

O. Jabiyo, Mabi, Abeyuelo- You watch as your mother smoothes the tough skin of the Jabiyo fruit into a moon shape for her necklace. You want to make a necklace like hers! You start by stringing the small seeds of Mabi and Abeyuelo together. Then, you bring the necklace to your mother who puts it around your neck. She is very proud of your first necklace.

P. Ceiba- You gather with your tribe around the Ceiba tree. You are bored by the *Cacique*'s talk about the harvest. You wander around the adults, trying to find something fun to do, and the *Behique* gently pulls you down next to him. He tells you that every spike on the Ceiba tree is an ancestor. You look up at the tree in wonder, and try to find your grandmother on the tree. Maybe she is that big spike at the very top!

Q. Cojóbana- You see the *Cacique* offer crushed seeds of the Cojóbana tree to the *cemi*, before taking the *cohoba* to speak with the spirits. You hear from the student of the *Behique* that the *cohoba* helps you think. You wonder if his student is telling the truth.

R. Jagüey- Today you finally get to help your father hunt! You climb the same Jagüey tree where you caught your pet parrot, which is now on your shoulder. Your parrot calls other parrots to the area, you catch them with a little rope loop. You hand the parrots down to your father who brings them back to the village for their meat and feathers. You are very proud to be able to help your village!

GARDEN

S. Yuca, Lerén, Yautia - You travel to a new area of the forest to build a *conuco* for your mother. You help your father cut down all the plants that the tribe does not need and burn them. It is sad to see the fire, but your father tells you the land is not being hurt - the ashes will make the plants grow even bigger.

After the fire is long gone, you return to the area with your mother to build mounds. You know that this is important, because last year the mounds saved the vegetables from the floods. Your mother also likes the mounds because the Yuca, Lerén, and Yautia roots are much easier to dig up this way.

Your mother uses the Yuca roots in many ways. The sweet Yuca is baked or boiled, while the bitter Yuca is used to make flour. You remember watching your mother do this when you were younger. First, she grinds the Yuca into a pulp and places it into a stretchy woven tube. Then she pinches the tube to squeeze out the bad juices. This pulp was then dried and made into the flour used for delicious cassava bread.

TAINO GROVE

T. Achiote, Jagua- You like to play with the Achiote. The fruit has a prickly skin that makes you curious. Inside the seeds are very small and bright orange. Be careful! The seeds leave an orange stain on your skin. This reminds you of watching your father get ready for the Areytos. He paints his face and chest with black paint from the fruit of the Jagua tree. One day you will wear body paint and be part of the Areytos too!

U. Tartago emético– You decide to pick the red flowers of the Tartágo emético and wear them in your hair. When your father sees you, he laughs and pulls the flowers from your hair. He warns you never to touch these flowers again. He explains that the seeds are saved for special times to prepare the body for religious ceremonies.

V. Chambibe- You go to the river, which has been prepared with a dam, to catch fish with your father. Your father picks out some Chambibe seeds from his pouch and hands them to you. On one of the rocks along the riverbank, you smash the seeds and throw them into the river. You watch as the fish float up, towards the dam, as if they are dead. Your father walks into the river toward the fish. You get the basket ready and catch the fish as your father throws them to you. You can almost taste the baked fish your mother will make tonight!

W. Algodon- As a young Taíno girl, you cannot wait for the day that you get married and can wear a *naguas*. The Algodon trees that you and your mother visit will give you fluffy white cotton to make a *naguas*. You are secretly saving up cotton so that when you get married, you can make a *naguas* as long and as beautiful as your mother's.

X. Bulletwood- You and your friends dropped the *batos* into the river. What will you tell the grownups? They are going to have a game of *Batey* this afternoon, but now they have no ball. The Cupey tree is too far away and you won't get back in time for the game. Your friends quickly go to the Bulletwood tree for some sap. You gather a few twigs and use the sap from your friends to make a perfect *batos* that looks even better than the one you lost in the river. Maybe the adults will never notice!

Y. Maguey– Imagine yourself as a Taíno child. Where will you sleep? You sleep on a hammock made out of strings from the pounded Maguey leaves! You and your mother collect the strings, and weave them together to make hammocks for everyone in your family.

KEY and LEGEND

Common Name (Taíno Name)

Scientific Name

Uses As Symbols

= Food Source

= Medicine

= Tools or weapons

= Clothing or dyes

= Shelter or construction

Letters Correspond to the Interpretive Stories

Back to Our Forest Roots Trail System (FoRTS)

1. Guava (Guayaba) **A**
Psidium guajava

2. Cashew (Cajuil) **B**
Anacardium occidentale

3. Sour Sop (Guanábana) **C**
Annona muricata

4. Hog Plum (Jobo)
Spondias mombin

5. Avocado (Aguacate) **D**
Persea americana

6. Níspero, Sapodilla (Chicozapote)
Manilkara zapota

7. Caimito (Caimito) **E**
Chrysophyllum cainito

8. Mamey (Mamey) **F**
Mammea americana

9. Guamá (Guamá)
Inga laurina

10. Hicaco (Hicaco) **G**
Chrysobalanus icaco

11. Corázon (Mamón) **G**
Annona reticulata

12. Calambreña (Guarapo) **H**
Coccoloba venosa

13. Moca
Andira inermis

14. Guaraguao (Guaraguao)
Guarea trichilioides

15. Roble Blanco (Apamate) **I**
Didymopanax morototoni

16. Cedro Hembra (Caobana)
Cedrela odorata

17. Algarrobo (Guamá) **J**
Hymenaea courbaril

18. Palma Real (Yagua) **K**
Roystonea borinquena

19. Trumpet Tree (Yagrumo)
Cecropia peltata

20. Higüero (Higüero) **L**
Crescentia cujete

21. María (María)
Calophyllum brasiliense

22. Maga (Maga)
Montezuma speciosissima

23. Corozo, Prickly Palm (Aovara) **M**
Acrocomia media

24. Guácima (Guácima)
Guazuma ulmifolia

25. Cupey (Cupey)
Clusia rosea

26. Button Mangrove (Yana)
Conocarpus erectus

27. Ortegón (Soco)
Coccoloba swartzii

28. Jabilla (Jabiyo) **N & O**
Hura crepitans

29. Abeyuelo (Bitaran) **O**
Colubrina arborescens

30. Mabi **O**
Colubrina elliptica

31. Yarey
Sabal causiarum

32. Ceiba (Ceiba) **P**
Ceiba pentandra

33. Coaba
Amyris elemifera

34. Cojóbana (Cojóbana) **Q**
Piptadenia peregrina

35. Jagüey Blanco (Jagüey) **R**
Ficus laevigata

36. Lerén (Lerén) **S**
Calathea allouia

37. Yautia (Yautia) **S**
Xanthosoma sagittifolium

38. Manioc (Yuca) **S**
Manihot esculenta

39. Papaya (Papaya)
Carica papaya

40. Jagua (Jagua) **T**
Genipa americana

41. Achiote (Bija) **T**
Bixa orellana

42. Camasey (Camasey)
Miconia prasina

43. Uva de Playa (Guiabara)
Coccoloba uvifera

44. Tartigo Emetico (Tau tua) **U**
Jatropha multifida

45. Guara (Guara)
Cupania americana

46. Guayacán (Guayacán)
Guaiacum officinale

47. Chambibe **V**
Sapindus saponaria

48. Almácigo (Carana)
Bursera simaruba

49. Cotton, Algodon (Sarobei) **W**
Gossypium hirsutum

50. Bulletwood (Ausubo) **X**
Manilkara bidentata

51. Pineapple (Ananá)
Ananas comosus

52. Maguey (Maguey) **Y**
Agave americana